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syngo® PT Treatment VA11A
on *syngo*® VX02A

PT

DICOM Conformance Statement

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1 CONFORMANCE STATEMENT OVERVIEW

The ***syngo*® PT Treatment** is a workplace in a Siemens particle therapy center where the actual treatment of the patient is controlled. For this purpose the ***syngo*® PT Treatment** needs to access the necessary treatment information (plans). Additionally it needs to access and store the produced treatment evidence (records, images, etc.).

The ***syngo*® PT Treatment** therefore supports the following DICOM Network Services:

- Transfer
- Query / Retrieve

DICOM Media Services are not supported.

Table 1-1
NETWORK SERVICES

SOP Classes	Service Class User (SCU)	Service Class Provider (SCP)
Transfer		
Storage AE		
Basic Text SR	Yes	Yes
Enhanced SR	Yes	Yes
CSA Non-Image	Yes	Yes
CT Image Storage	Yes	Yes
RT Dose Storage	Yes	Yes
RT Image Storage	Yes	Yes
RT Ion Beams Treatment Record Storage	Yes	Yes
RT Ion Plan Storage	Yes	Yes
RT Treatment Summary Record	Yes	Yes
RT Structure Set Storage	Yes	Yes
Secondary Capture Image Storage	Yes	Yes
Spatial Registration Storage	Yes	Yes
X-Ray Angiographic Image Storage	Yes	Yes
Storage Commitment AE		
Storage Commitment Push Model	Yes	No
Storage Commitment Push Model well known SOP Instance	Yes	No
Query / Retrieve		
Query AE		
Study Root Query/Retrieve Information Model - FIND	Yes	No
Retrieve AE		
Study Root Query/Retrieve Information Model - MOVE	Yes	No

Table 1-2
UID VALUES

SOP Class Name	SOP Class UID	Category
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Transfer
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Transfer
CSA Non-Image	1.3.12.2.1107.5.9.1	Transfer
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Transfer
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Transfer
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Transfer
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9	Transfer
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	Transfer
RT Treatment Summary Record	1.2.840.10008.5.1.4.1.1.481.7	Transfer
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Transfer
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Transfer
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Transfer
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Transfer
Storage Commitment Push Model	1.2.840.10008.1.20.1	Transfer
Storage Commitment Push Model well known SOP Instance	1.2.840.10008.1.20.1.1	Transfer
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Query / Retrieve
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Query / Retrieve

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3 INTRODUCTION

The Conformance Statement describes the DICOM interface for the Siemens ***syngo*® PT Treatment** in terms of part 2 of [1].

3.1 AUDIENCE

This document is written for the people that need to understand how ***syngo*® PT Treatment** will integrate into their healthcare facility. This includes both those responsible for overall network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

3.2 REMARKS

The scope of this Conformance Statement is to facilitate communication with Siemens and other vendor's Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality as SCU and SCP, respectively.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended. The user should be aware of the following important issues:

- The comparison of different conformance statements is the first step towards assessing interconnectivity.
- Test procedures should be defined and tests should be performed by the user (BU) to validate the connectivity desired. DICOM itself and the conformance parts do not specify those.
- The standard will evolve to meet the user's future requirements. Siemens is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.

Siemens reserves the right to modify the design and specifications contained herein without prior notice. Please contact your local Siemens representative for the most recent product information.

3.3 TERMS AND DEFINITIONS

Informal definitions are provided for the following terms used in this Conformance Statement.
The DICOM Standard is the authoritative source for formal definition of these terms.

Abstract Syntax – the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples : Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

Application Entity (AE) – an end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title – the externally known name of an *Application Entity*, used to identify a DICOM application to other DICOM applications on the network.

Application Context – the specification of the type of communication used between *Application Entities*. Example: DICOM network protocol.

Association – a network communication channel set up between *Application Entities*.

Attribute – a unit of information in an object definition; a data element identified by a *tag*. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

Attribute Macro - a set of Attributes that are described in a single table that is referenced by multiple Module or other tables.

Information Object Definition (IOD) – the specified set of *Attributes* that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The *Attributes* may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Functional Group - A set of logically related Attributes that are likely to vary together. May be used in Multi-frame IODs to describe parameters which change on a per frame basis.

Joint Photographic Experts Group (JPEG) – Joint Photographic Experts Group, The group was organized in 1986, issuing a standard in 1992, which was approved in 1994 as ISO 10918-1. The JPEG standard is used by DICOM applications.

Media Application Profile – the specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs), see DICOM PS3.11.

Module – a set of *Attributes* within an *Information Object Definition* that are logically related to each other. Example: Patient Module includes (among others) Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation – first phase of *Association* establishment that allows *Application Entities* to agree on the types of data to be exchanged and how that data will be encoded.

Presentation Context – the set of DICOM network services used over an *Association*, as negotiated between *Application Entities*; includes *Abstract Syntaxes* and *Transfer Syntaxes*.

Protocol Data Unit (PDU) – a packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

Security Profile – a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an *Application Entity* to ensure confidentiality, integrity, and/or availability of exchanged DICOM data.

Service Class Provider (SCP) – role of an *Application Entity* that provides a DICOM network service; typically, a server that performs operations requested by another *Application Entity* (*Service Class User*). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

Service Class User (SCU) – role of an *Application Entity* that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU).

Service/Object Pair (SOP) Class – the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance – an information object; a specific occurrence of information exchanged in a *SOP Class*. Examples: a specific x-ray image.

Tag – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the "group" and the "element". If the "group" number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element].

Transfer Syntax – the encoding used for exchange of DICOM information objects and messages. Examples: *JPEG* compressed (images), little endian explicit value representation.

Unique Identifier (UID) – a globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – the format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

3.4 BASICS OF DICOM COMMUNICATION

This section describes terminology used in this Conformance Statement for the non-specialist. The key terms used in the Conformance Statement are highlighted in *italics* below. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Two *Application Entities* (devices) that want to communicate with each other over a network using DICOM protocol must first agree on several things during an initial network "handshake". One of the two devices must initiate an *Association* (a connection to the other device), and ask if specific services, information, and encoding can be supported by the other device (*Negotiation*).

DICOM specifies a number of network services and types of information objects, each of which is called an *Abstract Syntax* for the Negotiation. DICOM also specifies a variety of methods for encoding data, denoted *Transfer Syntaxes*. The Negotiation allows the initiating Application Entity to propose combinations of Abstract Syntax and Transfer Syntax to be used on the Association; these combinations are called *Presentation Contexts.* The receiving Application Entity accepts the Presentation Contexts it supports.

For each Presentation Context, the Association Negotiation also allows the devices to agree on *Roles* – which one is the *Service Class User* (SCU - client) and which is the *Service Class Provider* (SCP - server). Normally the device initiating the connection is the SCU, i.e., the client system calls the server, but not always.

The Association Negotiation finally enables exchange of maximum network packet (*PDU*) size, security information, and network service options (called *Extended Negotiation* information).

The Application Entities, having negotiated the Association parameters, may now commence exchanging data. Common data exchanges include queries for worklists and lists of stored images, transfer of image objects and analyses (structured reports), and sending images to film printers. Each exchangeable unit of data is formatted by the sender in accordance with the appropriate *Information Object Definition*, and sent using the negotiated Transfer Syntax. There is a Default Transfer Syntax that all systems must accept, but it may not be the most efficient for some use cases. Each transfer is explicitly acknowledged by the receiver with a *Response Status* indicating success, failure, or that query or retrieve operations are still in process.

Two Application Entities may also communicate with each other by exchanging media (such as a CD-R). Since there is no Association Negotiation possible, they both use a *Media Application Profile* that specifies "pre-negotiated" exchange media format, Abstract Syntax, and Transfer Syntax.

3.5 ABBREVIATIONS

Abbreviation	Definition
ACR	American College of Radiology
AE	DICOM Application Entity
ASCII	American Standard Code for Information Interchange
DB	Database
DCS	DICOM Conformance Statement
DIMSE	DICOM Message Service Element
DSA	Digital Subtraction Angiography
IIDC	Image-Intensifier Distortion Correction
IOD	DICOM Information Object Definition
ISO	International Standard Organization
MWL	Modality Worklist
NEMA	National Electrical Manufacturers Association
O	Optional Key Attribute
PDU	DICOM Protocol Data Unit
PT	Particle Therapy
R	Required Key Attribute
RIS	Radiology Information System
RTT-PT	Radiation Therapy Therapist for Particle Therapy (Equivalent to the product name ***syngo*® PT Treatment**.)
SC	Storage Commitment
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM server)
SOP	DICOM Service-Object Pair
syngo Classic	All *syngo* versions prior and equal to VE31B.
syngo.NET	All *syngo* version equal to and following “syngo VX02A enterprise platform”.
syngo RT	Short name for *syngo* Suite for Oncology.
syngo Suite for Oncology	New name for the COHERENCE product family after rebranding according to the Siemens Healthcare wide naming concept.
U	Unique Key Attribute

3.6 REFERENCES

[1] Digital Imaging and Communications in Medicine (DICOM), PS 3.1-2008 – PS 3.18-2008, National Electrical Manufacturers Association (NEMA).

[2] IHE Radiology Technical Framework, Vol. I – IV, http://www.ihe.net/Technical_Framework.

3.7 SCOPE AND FIELD OF APPLICATION

The follwing figure gives an overview about the capabilities of the ***syngo*® PT Treatment**.

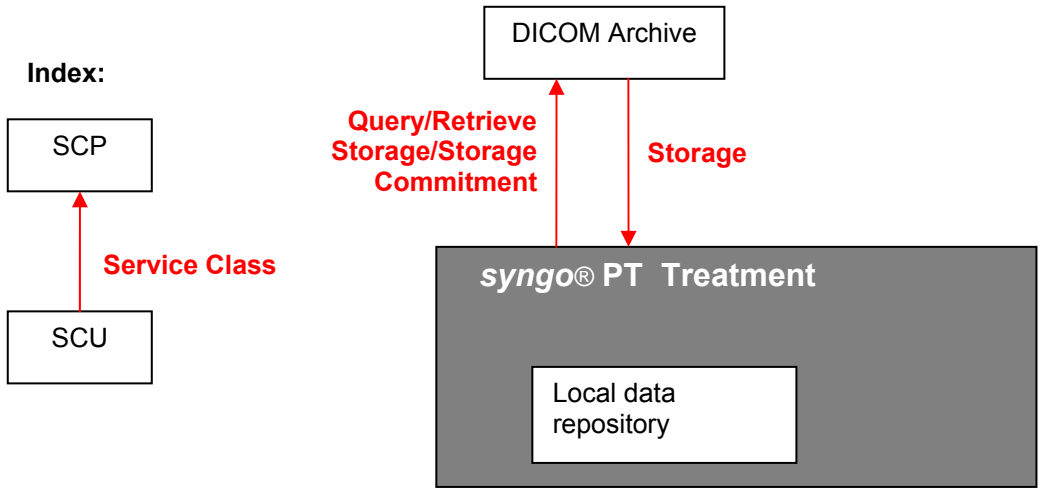


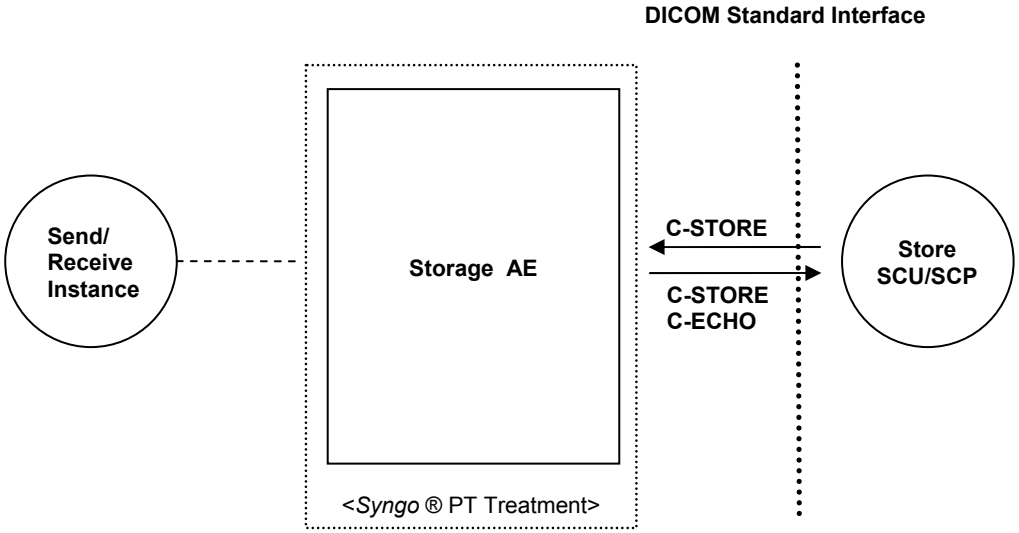
Figure 3-1: Overview about DICOM capabilities of *syngo*® PT Treatment

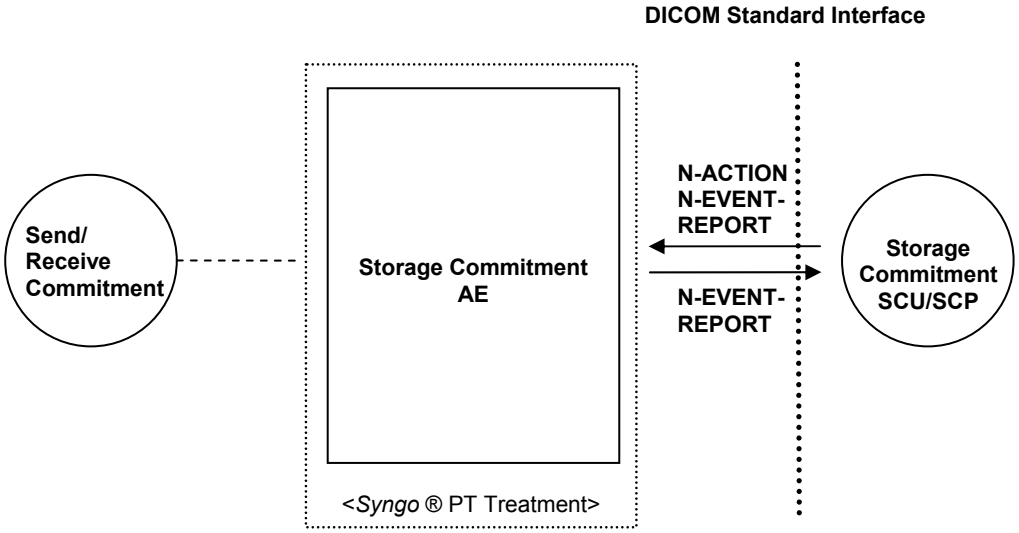
4 NETWORKING

4.1 IMPLEMENTATION MODEL

4.1.1 Application Data Flow

Storage AE





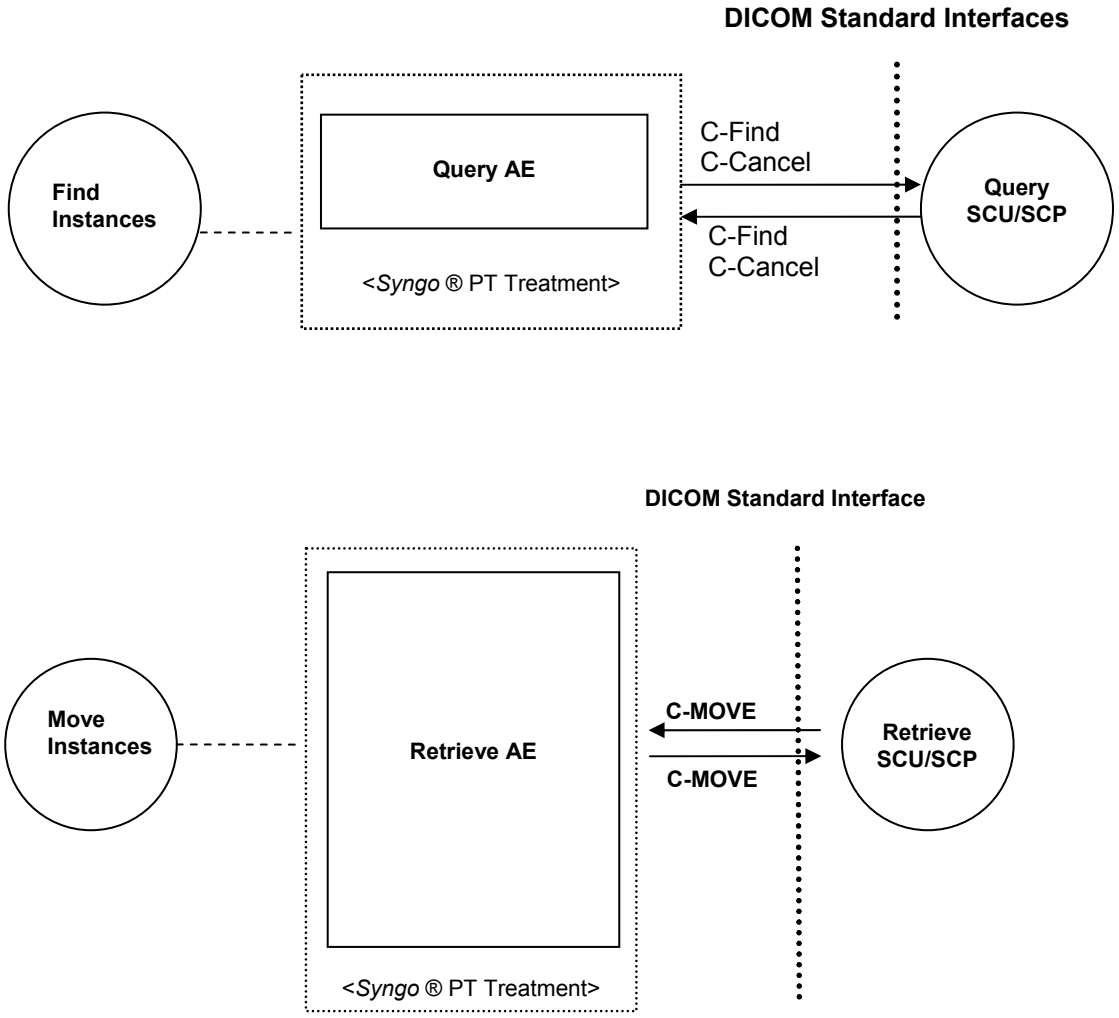


Figure 4-2: Functional Overview

4.1.2 Functional Definition of AE's

The SCP components of the Application Entities of the ***syngo*® PT Treatment** operate as background server processes. They exist as soon as the system is powered up and wait for association requests. Upon accepting an association with a negotiated Presentation Context they start to receive and process the request described in the following sections.

4.1.2.1 Storage AE

SCU:

The Storage SCU is invoked either directly by the user, by an auto-archive trigger or internally by the Query/Retrieve Application Entity that is responsible for processing retrieve requests. The request consists of data describing the composite image objects selected for storage and the destination AET. An association is negotiated with the destination AE and the image data is transferred using the C-STORE DIMSE-Service. The transfer status is reported to the initiator of the Storage request.

SCP:

The Storage SCP starts to receive the Composite Image Objects and import them into the database after accepting an association with a negotiated Presentation Context. The system can be configured in such a way, that Responses to the Storage Request are sent immediately after reception of the Data, or after persistent storage on the hard disc or after storage & indexing in the DB.

4.1.2.2 Storage Commitment AE

SCU:

Additional to each successfully completed send job, modalities should trigger a Storage Commitment request for the safekeeping of the images sent to the ***syngo*® PT Treatment**.

Storage Commitment Request will be sent after a configurable delay.

Storage Commitment Request is always sent in an additional Association.

SCP:

The Storage Commitment SCP will always send the N-EVENT REPORT Request on a new association.

4.1.2.3 Query AE

SCU:

The C-FIND request to the remote SCP is invoked directly by the user. The remote SCP returns a list of responses with defined data, which are displayed to the user. The user can decide to start a retrieval or to issue another query.

The ***syngo*® PT Treatment** supports:

- the Study Root Query Model.

SCP:

The C-FIND SCP will perform a query on the local data repository and return the matching items.

4.1.2.4 Retrieve AE

SCU:

SCU initiate a C-MOVE request to the remote Retrieve SCP. The remote Retrieve SCP in turn starts C-STORE suboperations to the ***syngo*® PT Treatment** Storage SCP.

SCP:

Respond to C-MOVE requests from a remote SCU. C-MOVE requests involve the ***syngo*® PT Treatment** DICOM Query/Retrieve SCP application to initiate a C-STORE sub-operation to send image objects to a remote Storage SCP.

4.1.3 Sequencing of Real-World Activities

Storage / Storage Commit:

The communication between ***syngo*® PT Treatment** and an external DICOM node in case of triggering the transfer of objects from ***syngo*® PT Treatment** to the external node is depicted in Figure 4-3 in more detail.

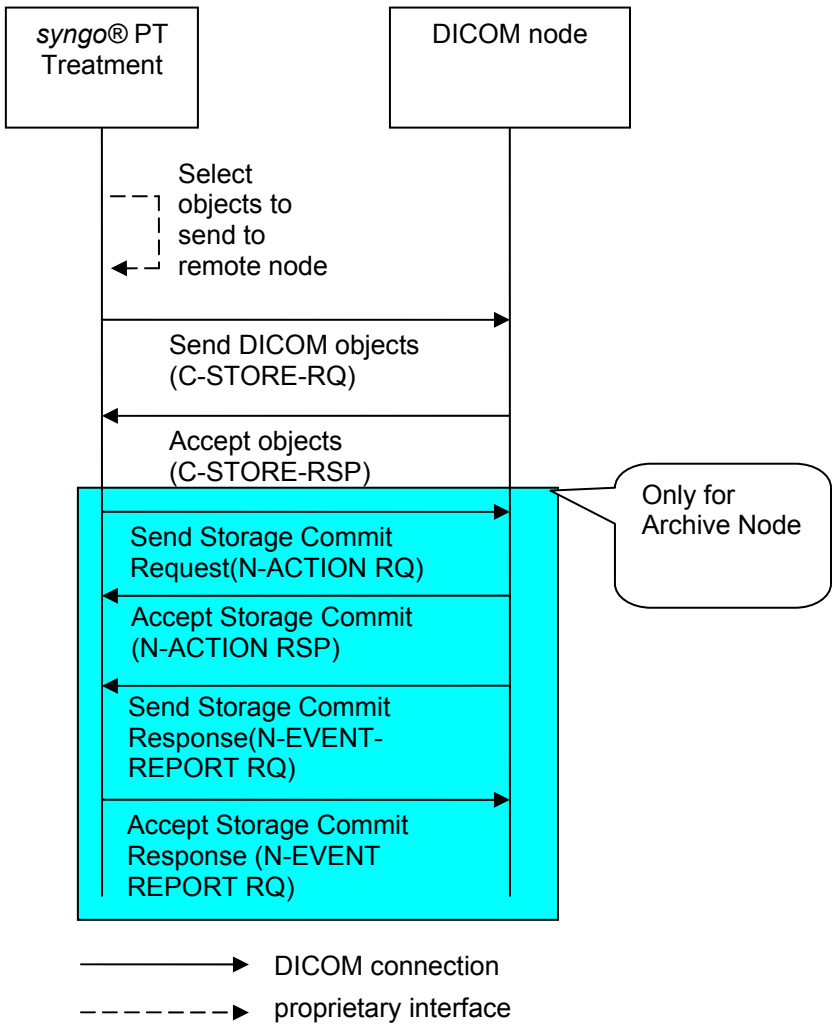

syngo® PT Treatment
DICOM node
Select objects to send to remote node
Send DICOM objects (C-STORE-RQ)
Accept objects (C-STORE-RSP)
Only for Archive Node
Send Storage Commit Request(N-ACTION RQ)
Accept Storage Commit (N-ACTION RSP)
Send Storage Commit Response(N-EVENT-REPORT RQ)
Accept Storage Commit Response (N-EVENT REPORT RQ)
DICOM connection
proprietary interface

Figure 4-3: Sequence diagram of storage / storage commitment from *syngo*® PT Treatment to a remote node

Query and Retrieval:

The following figure depicts, that query and retrieval is distributed over the ***syngo*® PT Treatment** application server and the ***syngo*® PT Treatment** RTC.

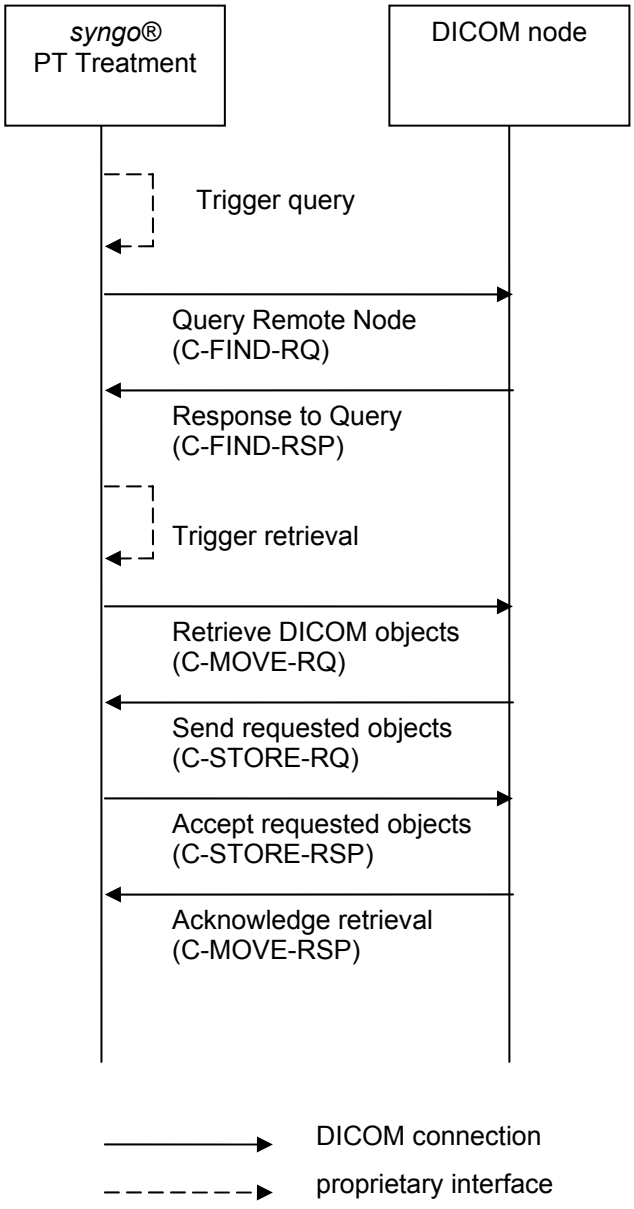


Figure 4-4: Sequence diagram - Query/Retrieve

4.2 AE SPECIFICATIONS

4.2.1 Storage AE

4.2.1.1 SOP Classes

Table 4-1
SOP CLASSES FOR STORAGE AE

SOP Class Name	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)
Supported Storage SOP Classes			
Basic Text SR	1.2.840.10008.5.1.4.1.1.88.11	Yes	Yes
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.22	Yes	Yes
CSA Non-Image	1.3.12.2.1107.5.9.1	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Yes	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Yes	Yes
RT Ion Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.9	Yes	Yes
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	Yes	Yes
RT Treatment Summary Record	1.2.840.10008.5.1.4.1.1.481.7	Yes	Yes
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	Yes
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	Yes	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes

4.2.1.2 Association Policies

4.2.1.2.1 General

Table 4-2:
DICOM APPLICATION CONTEXT

Application Context Name	1.2.840.10008.3.1.1.1

4.2.1.2.2 Number of Associations

Table 4-3:
NUMBER OF ASSOCIATIONS AS AN ASSOCIATION INITIATOR FOR STORAGE AE

Maximum number of simultaneous associations	unlimited

Table 4-4:
NUMBER OF ASSOCIATIONS AS AN ASSOCIATION ACCEPTOR FOR STORAGE AE

Maximum number of simultaneous associations	*Configurable between 1 and 30, default: 5*

4.2.1.2.3 Asynchronous Nature

The ***syngo*® PT Treatment** supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted. By mean of configuration change, it can be possible to have the SCP accept infinite Window size.

Table 4-5:
ASYNCHRONOUS NATURE AS AN ASSOCIATION INITIATOR FOR STORAGE AE

Maximum number of outstanding asynchronous transactions	Infinite

4.2.1.2.4 Implementation Identifying Information

Table 4-6
DICOM IMPLEMENTATION CLASS AND VERSION FOR STORAGE AE

Implementation Class UID	<NA>
Implementation Version Name	<NA>

4.2.1.3 Association Initiation Policy

***syngo*® PT Treatment** initiates associations while processing the service operations and internal messages as shown below:

Operation or Real-World Activity	Association for
Send / Receive Instance	C-STORE, C-ECHO

4.2.1.3.1 Activity "Send To"

4.2.1.3.1.1 Description and Sequencing of Activities

Storage of DICOM object is either triggered by a C-MOVE request initiated by an external DICOM AE to ***syngo*® PT Treatment** or internally in the ***syngo*® PT Treatment**.

If an association to a remote Application Entity could successfully be established, each image will be transferred one after another via the same open association.

Automatic retry mechanism:
it is configurable, how many retry attempts are performed before the job goes to failed.
Retry is done if:
a) if the network connection has been lost from SCU perspective. In this case retry is performed as soon as the network connection is available again.
b) the partner is not reachable for other reasons (e.g. partner node has broken down). For this case a (global, configurable) timeout has been implemented after which retry is performed.

4.2.1.3.1.2 Proposed Presentation Contexts

Table 4-7
PROPOSED PRESENTATION CONTEXTS FOR STORAGE AE

For all supported images (see SOP Classes in Table 4-1
SOP CLASSES FOR STORAGE AE) the following Transfer Syntaxes are supported:

UID	Name
1.2.840.10008.1.2.2	Explicit Value Representation Big Endian native
1.2.840.10008.1.2.1	Explicit Value Representation Little Endian native
1.2.840.10008.1.2	Implicit Value Representation Little Endian native
1.2.840.10008.1.2.4.91	JPEG 2000 Image Compression lossy compressed
1.2.840.10008.1.2.4.90	JPEG 2000 Image Compression (Lossless Only) lossless compressed
1.2.840.10008.1.2.4.50	JPEG Baseline (Process 1) lossy compressed
1.2.840.10008.1.2.4.51	JPEG Extended (Process 2 & 4) lossy compressed
1.2.840.10008.1.2.4.70	JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14) lossless compressed
1.2.840.10008.1.2.5	RLE Lossless lossless compressed

Table 4-8
EXTENDED NEGOTIATION AS AN SCU

There is no extended negotiation as an SCU.

4.2.1.3.1.3 SOP specific Conformance for SOP classes

The ***syngo*® PT Treatment** will not add or change private attributes, even in case objects are compressed or image header is updated according to IHE [2] Patient Information Reconciliation.

Table 4-9
DICOM COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Error	Sending partially or completely failed	Any; None; null; Code	Failure reported to user (percentage of transferred instances is shown)
Success	Image is successfully stored on file system.	0000	Success reported to user

Table 4-10
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	Failure reported to user (Timeout configurable; default 30s)
Association Aborted	Failure reported to user

4.2.1.4 Association Acceptance Policy

The ***syngo*® PT Treatment** attempts to accept a new association for

- DIMSE C-STORE

service operations.

Generally associations are accepted if all of the following conditions are true:

- The "called AET" matches one of the configured Application Entity Titles of the ***syngo*® PT Treatment**.
- The "calling AET" is allowed to connect to ***syngo*® PT Treatment**. This check can be disabled.
- The maximum number of incoming associations is not reached.
- At least one Presentation Context has been proposed with at least one suitable transfer syntax as defined by the "Presentation Context Tables" in the following subsections.

Generally all Presentation Contexts are accepted as long as they contain at least one suitable Transfer Syntax. All other Presentation Contexts are rejected.

If a Proposed Presentation Context contains more than one Transfer Syntax, the one in the following priority list is chosen (if applicable for the SOP class):

```
1) Explicit Value Representation Little Endian
2) Implicit Value Representation Little Endian
3) Explicit Value Representation Big Endian
4) JPEG Baseline (Process 1)
5) JPEG Extended (Process 2 & 4)
6) JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14)
```

```
7) JPEG 2000 Image Compression (Lossless Only)
8) JPEG 2000 Image Compression
9) RLE Lossless
```

4.2.1.4.1 Activity "Receive Instances"

4.2.1.4.1.1 Description and Sequencing of Activities

The ***syngo*® PT Treatment** receiving process will accept an association, receive any images transmitted on that association and store the images on disk. It will store some header attributes in the database in order to allow clients to query these attributes.

4.2.1.4.1.2 Accepted Presentation Contexts

Table 4-11
ACCEPTABLE PRESENTATION CONTEXTS FOR STORAGE AE AND ACTIVITY "RECEIVE INSTANCES

Same as specified in section 4.2.1.3.1.2.

Table 4-12
EXTENDED NEGOTIATION AS AN SCP
There is no Extended Negotiation as an SCP

4.2.1.4.1.3 SOP-specific Conformance Statement for Storage SOP classes

The ***syngo*® PT Treatment** conforms to the Full Storage Class at Level 2.

In case of a successful C-STORE operation, the image has successfully been written on disk either in Explicit Little Endian format or in the compression format received.

The Storage AE of the ***syngo*® PT Treatment** returns the status "success" when the data is stored to disk and a minimal image header validation has been performed.

The following header attributes must be available and filled:

- Patient Name,
- Study Instance UID,
- Series Instance UID and
- SOP Instance UID.

Restriction: successful operation does not guarantee storage of header data in the database.

Table 4-13
STORAGE C-STORE RESPONSE STATUS

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	Image received correctly (success notification is done after receiving, before indexing and storing)
Failure	Out-of-resource	0xA700	Not resource left in the Short Term Storage
Failure	Unable to Process	0xCxxx	Error during instance reception
Failure	DataSet does not match SOP Class	0xA9xx	The DataSet is not conform to the SOP Class contained in the resource.

4.2.1.4.1.4 Other SOP specific behavior

- If an image is received that is already stored in the database - identified by the SOP Instance UID - the new image will be ignored. The existing instance is not superseded.
- The Patient Quadruplet (Patient's Name, Patient ID, Date of Birth, Patient Sex) is internally used for unique identification. The Patient ID is specified as a "type 2" attribute by DICOM. Therefore the attribute must be in the message but it may be empty. f the Patient ID is missing it will be generated and inserted to the index by the ***syngo*® PT Treatment** for internal purposes.

4.2.2 Storage Commitment AE

4.2.2.1 SOP Classes

Table 4-14:
SOP CLASSES FOR STORAGE COMMITMENT AE

SOP Class Name	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)
Supported Query/Retrieve SOP Classes			
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	No
Storage Commitment Push Model well known SOP Instance	1.2.840.10008.1.20.1.1	Yes	No

4.2.2.2 Association Policies

4.2.2.2.1 General

Table 4-15
DICOM APPLICATION CONTEXT

Application Context Name	1.2.840.10008.3.1.1.1

4.2.2.2.2 Number of Associations

Table 4-16:
NUMBER OF ASSOCIATIONS AS AN ASSOCIATION INITIATOR FOR STORAGE COMMITMENT AE

Maximum number of simultaneous associations	unlimited

Table 4-17:
NUMBER OF ASSOCIATIONS AS AN ASSOCIATION ACCEPTOR FOR STORAGE COMMIT AE

Maximum number of simultaneous associations	*Configurable between 1 and 30, default: 5*

4.2.2.2.3 Asynchronous Nature

The ***syngo*® PT Treatment** supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted. By mean of configuration change, it can be possible to have the SCP accept infinite Window size.

Table 4-18:
ASYNCHRONOUS NATURE AS AN ASSOCIATION INITIATOR FOR STORAGE COMMITMENT AE

Maximum number of outstanding asynchronous transactions	Infinite

4.2.2.2.4 Implementation Identifying Information

Table 4-19
DICOM IMPLEMENTATION CLASS AND VERSION FOR STORAGECOMMIT AE

Implementation Class UID	<NA>
Implementation Version Name	<NA>

4.2.2.3 Association Initiation Policy

***syngo*® PT Treatment** initiates associations while processing the service operations and internal messages as shown below:

Operation or Real-World Activity	Association for
Storage Commitment	N-ACTION N-EVENT-REPORT

Association Initiation Policy – Storage Commitment AE

4.2.2.3.1 Activity "Send Initial Storage Commitment"

4.2.2.3.1.1 Description and Sequencing of Activities

After Sending Images to its Archive, the ***syngo*® PT Treatment** will initiate a Storage Commitment request if configured. The ***syngo*® PT Treatment** initiates a new association in order to send the N-ACTION-RQ to the SCP.

4.2.2.3.1.2 Proposed Presentation Contexts

Table 4-20
PROPOSED PRESENTATION CONTEXTS FOR STORAGE COMMITMENT AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Storage Commitment Push Model well known SOP Instance	1.2.840.10008.1.20.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

- **SC on separate association**

Table 4-21
EXTENDED NEGOTIATION AS AN SCU
There is no extended negotiation as an SCU.

4.2.2.3.1.3 SOP specific Conformance for SOP classes

Table 4-22
DICOM COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Error		Any; none; null; Code	Failure reported to user
Success		0000	Success reported to user

Table 4-23
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	Failure reported to user (Timeout configurable; default 30s)
Association Aborted	Failure reported to user

4.2.2.3.2 Activity "Send Reply to Commitment Requests on separate associations"

4.2.2.3.2.1 Description and Sequencing of Activities

In case the ***syngo*® PT Treatment** has received a Storage Commitment request from an external node and the external node has closed the association, ***syngo*® PT Treatment** initiates a new association in order to send the N-EVENT-REPORT-RQ to the SCP (Storage Commitment initiator).

4.2.2.3.2.2 Proposed Presentation Contexts

Table 4-24
PROPOSED PRESENTATION CONTEXTS FOR STORAGE COMMITMENT AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

Table 4-25
EXTENDED NEGOTIATION AS AN SCP
There is no extended negotiation as an SCP.

4.2.2.3.2.3 SOP specific Conformance for SOP classes

Table 4-26
DICOM COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Error	Storage Commitment Reply ignored.	Any; none; null; Code	Storage Commitment will be repeated..
Success	Storage Commitment Reply noticed.	0000	Success reported to user.

Table 4-27
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR
No special behavior.

4.2.2.4 Association Acceptance Policy

The ***syngo*® PT Treatment** attempts to accept a new association for

- DIMSE N-ACTION (Storage Commitment)

service operations.

Generally associations are accepted if all of the following conditions are true:

- The "called AET" matches one of the configured Application Entity Titles of the ***syngo*® PT Treatment**. This check can be disabled.
- The maximum number of incoming associations is not reached.
- At least one Presentation Context has been proposed with at least one suitable transfer syntax as defined by the "Presentation Context Tables" in the following subsections.

Generally all Presentation Contexts are accepted as long as they contain at least one suitable Transfer Syntax. All other Presentation Contexts are rejected.

4.2.2.4.1 Activity "Receive Initial Storage Commitment Request"

4.2.2.4.1.1 Description and Sequencing of Activities

When receiving an initial Storage Commitment request the ***syngo*® PT Treatment** will accept it with a N-ACTION-RQ and trigger a check in the DataBase for the Required images.

4.2.2.4.1.2 Accepted Presentation Contexts

Table 4-28
ACCEPTABLE PRESENTATION CONTEXTS FOR STORAGE COMMITMENT AE AND ACTIVITY "RECEIVE COMMITMENT REQUEST

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

Table 4-29
EXTENDED NEGOTIATION AS AN SCP

There is no extended negotiation as an SCP

4.2.2.4.1.3 SOP-Specific Conformance Statement for SC SOP classes

There are only 2 different return status codes for the commitment request itself. They indicate only whether the request was successfully received or not. The real response is sent via N-EVENT-REPORT-RQ either on the same or on a different association.

Success or failure of Storage Commitment will be signaled via the N-EVENT-REPORT primitive.

The client application is responsible for creating a unique Transaction UID. The provider will not check, whether the UID is already in use or not.

Table 4-30
STORAGE COMMITMENT N-EVENT-REPORT RESPONSE STATUS

Service Status	Further Meaning	Error Codes	Reason	Related Fields
Success	Success	0x0000	Image received correctly (success notification is done after receiving, before indexing and storing)	
Failure	Unable to Process	0xCxxx	Error during instance reception	
Failure	DataSet does not match SOP Class	0xA9xx	The DataSet is not conform to the SOP Class contained in the resource.	

4.2.2.4.2 Activity "Receive Reply to Commitment Requests on separate associations"

4.2.2.4.2.1 Description and Sequencing of Activities

When receiving a Reply Storage Commitment Request N-EVENT-REPORT-RQ as an answer to a former Storage Commitment Reguest, the ***syngo*® PT Treatment** marks the images as "Archived".

4.2.2.4.2.2 Accepted Presentation Contexts

Table 4-31
ACCEPTABLE PRESENTATION CONTEXTS FOR STORAGE COMMITMENT AE AND ACTIVITY "RECEIVE COMMITMENT REQUEST

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

Table 4-32
EXTENDED NEGOTIATION AS AN SCP

There is no extended negotiation as an SCP

4.2.2.4.2.3 SOP-Specific Conformance Statement for SC SOP classes

There are only 2 different return status codes for the commitment request itself. They indicate only whether the request was successfully received or not. The real response is sent via N-EVENT-REPORT-RQ on a different association.

Success or failure of Storage Commitment will be signaled via the N-EVENT-REPORT primitive.

The client application is responsible for creating a unique Transaction UID. The provider will not check, whether the UID is already in use or not.

Table 4-33
STORAGE COMMITMENT N-EVENT-REPORT RESPONSE STATUS

Service Status	Further Meaning	Error Codes	Reason	Related Fields
Success	Success	0x0000	Image received correctly (success notification is done after receiving, before indexing and storing)	
Failure	Unable to Process	0xCxxx	Error during instance reception	
Failure	DataSet does not match SOP Class	0x0112	The DataSet is not conform to the SOP Class contained in the resource.	

4.2.3 Query AE

4.2.3.1 SOP Classes

The ***syngo*® PT Treatment** provides Standard Conformance to the following DICOM V3.0 SOP Classes as SCP / SCU:

Table 4-34
SOP CLASSES FOR QUERY AE

SOP Class Name	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)
Supported Query/Retrieve SOP Classes			
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	No

4.2.3.2 Association Policies

4.2.3.2.1 General

Table 4-35
DICOM APPLICATION CONTEXT

Application Context Name	1.2.840.10008.3.1.1.1

4.2.3.2.2 Number of Associations

Table 4-36
NUMBER OF ASSOCIATIONS AS AN ASSOCIATION INITIATOR FOR QUERY AE

Maximum number of simultaneous associations	*unlimited*

Table 4-37:
NUMBER OF ASSOCIATIONS AS AN ASSOCIATION ACCEPTOR FOR QUERY AE

Maximum number of simultaneous associations	*Configurable between 1 and 30, default: 5*

4.2.3.2.3 Asynchronous Nature

The ***syngo*® PT Treatment** supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted. By mean of configuration change, it can be possible to have the SCP accept infinite Window size.

Table 4-38:
ASYNCHRONOUS NATURE AS AN ASSOCIATION INITIATOR FOR QUERY AE

Maximum number of outstanding asynchronous transactions	Infinite

4.2.3.2.4 Implementation Identifying Information

The ***syngo*® PT Treatment** provides a single Implementation Class UID of:

Table 4-39
DICOM IMPLEMENTATION CLASS AND VERSION FOR QUERY AE

Implementation Class UID	<NA>
Implementation Version Name	<NA>

4.2.3.3 Association Initiation Policy

The ***syngo*® PT Treatment** will initiate new associations for the following operations as SCU:

Operation or Real–World Activity	Association for
Querying a Remote Node	C-FIND

Association Initiation Policy - Query AE

4.2.3.3.1 Activity "Querying a Remote Node"

4.2.3.3.1.1 Description and Sequencing of Activities

The associated Real-World activity is a C-Find request initiated by the user of the Reporting station. The user specifies some attributes the remote Application should use to query its database. If the query user successfully establishes an association to the remote Application Entity, it will send a C-Find request (according to the query model) and will then return the results to the application.

4.2.3.3.1.2 Proposed Presentation Contexts

The ***syngo*® PT Treatment** will propose Presentation Contexts as shown in the following table:

Table 4-40
PROPOSED PRESENTATION CONTEXTS FOR QUERY AE AND ACTIVITY "RECEIVE A REMOTE NODE"

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Study Root Query/ Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	Yes
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

Table 4-41
EXTENDED NEGOTIATION AS AN SCU

Name	UID	Extended Negotiation
Study Root Query/ Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Relational Query will be negotiated if necessary as defined in DICOM PS3.4.

4.2.3.3.1.3 SOP Specific Conformance Statement to Query SOP classes

The ***syngo*® PT Treatment** check for the following status codes in the Query SCP's C-Find-Response:

Table 4-42
DICOM COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Error		Any; none; null; Code	Failure reported to user
Success		0000	Success reported to user

Table 4-43
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	Failure reported to user (Timeout configurable; default 30s)
Association Aborted	Failure reported to user

The ***syngo*® PT Treatment** supports the following query levels:

- Study

The following table lists the various attributes at Patient, Study, and Series levels, which can be used for **relational** queries as well as return values for display:

Table 4-44
Attributes supported for relational Query

Tag	Name	Appears in UI as
Patient Level		
(0010,0010)	Patient's Name	
(0010,0020)	Patient ID	
(0010,0021)	Issuer of Patient ID	
(0010,1000)	Other Patient IDs	
(0010,1001)	Other Patient Names	
(0010,1005)	Patient's Birth Name	
(0010,1010)	Patient's Age	
(0010,2180)	Occupation	
(0040,3001)	Confidentiality Constraint on Patient Data Description	Confidentiality Constraint
(0010,0030)	Patient's Birth Date	Date of Birth
(0010,0032)	Patient's Birth Time	Time of Birth
(0010,0040)	Patient's Sex	Sex
(0010,1020)	Patient's Size	
(0010,1030)	Patient's Weight	
(0010,1040)	Patient's Address	
(0010,1080)	Military Rank	
(0010,2154)	Patient's Telephone Numbers	
(0010,2160)	Ethnic Group	
(0010,4000)	Patient Comments	
(0010,2000)	Medical Alerts	
(0010,2110)	Contrast Allergies	
(0010,21A0)	Smoking Status	
(0010,21B0)	Additional Patient History	
(0010,21C0)	Pregnancy Status	
(0010,21D0)	Last Menstrual Date	
(0038,0050)	Special Needs	
(0038,0500)	Patient State	
Study Level		
(0008,0020)	Study Date	
(0008,0030)	Study Time	
(0008,0050)	Accession Number	
(0020,0010)	Study ID	
(0020,000D)	Study Instance UID	
(0008,0061)	Modalities in Study	Modality
(0008,0090)	Referring Physician' s Name	Referring Physician
(0008,1030)	Study Description	
(0008,1060)	Physician Reading Study	Reading Physician
(0008,1080)	Admitting Diagnoses Description	
(0010,0021)	Issuer of Patient ID	
(0010,1010)	Patient's Age	
(0010,1020)	Patient's Size	

Tag	Name	Appears in UI as
(0010,1030)	Patient's Weight	
(0010,2180)	Occupation	
(0020,1206)	Number of Study related Series	# Series in Study
(0020,1208)	Number of Study related Instances	# Instances in Study
(0008,1048)	Physician of Record	
Series Level		
(0008,0060)	Modality	
(0020,0011)	Series Number	
(0020,000E)	Series Instance UID	
(0020,1209)	Number of Study related Instances	# Instances in Series
(0018,0015)	Body Part Examined	
(0008,0021) (0008,0031)	Series Date Series Time	Series Date and Time
(0008,103E)	Series Description	
(0018,5100)	Patient Position	
(0020,0060)	Laterality	
(0040,0244)	Performed Procedure Step Start Date	
(0040,0245)	Performed Procedure Step Start Time	
(0040,0253)	Performed Procedure Step ID	
(0008,1090)	Manufacturer's Model Name	
(0018,1030)	Protocol Name	
(0008,1050)	Performing Physician's Name	
(0008,1070)	Operator's Name	
Instance Level		
(0008,0018)	SOP Instance UID	
(0020,0013)	Instance Number	
(0018,0016)	SOP Class UID	
(0028,0008)	Number of Frames	
(0028,0010) (0028,0011)	Rows Columns	Rows x Columns
(0008,0008)	Image Type	
(0008,0012)	Creation Date	
(0008,0014)	Instance Creator	
(0020,4000)	Image Comments	
(0008,0056)	Instance Availability	
(0040,A043)	Concept Name Code Sequence	SR Document Title
(0040,A491)	Completion Flag	
(0040,A493)	Verification Flag	
(0070,0080)	Presentation State Content Label	
(0070,0081)	Presentation State Content Description	
(0070,0082) (0070,0083)	Presentation Creation Date Presentation Creation Time	Presentation Creation Date/Time
(0070,0084)	Presentation Content Creator's Name	
(0008,0023) (0008,0033)	Content Date Content Time	Content Date and Time
(0020,0012)	Acquisition Number	

Tag	Name	Appears in UI as
(0018,0080)	Repetition Time	
(0018,0081)	Echo Time	
(0020,1041)	Slice Location	
(0020,0020)	Patient Orientation	
(0008,0013)	Instance Creation Time	
(0008,0022)	Acquisition Date	
(0008,0054)	Retrieve AE Title	

4.2.3.4 Association Acceptance Policy

The ***syngo*® PT Treatment** Query AE attempts to accept a new association for

- DIMSE C-MOVE

service operation.

Generally associations are accepted if all of the following conditions are true:

- The "called AET" matches one of the configured Application Entity Titles of the ***syngo*® PT Treatment**. This check can be disabled.
- The "calling AET" is allowed to connect to ***syngo*® PT Treatment**. This check can be disabled.
- The maximum number of incoming associations is not reached.
- At least one Presentation Context has been proposed with at least one suitable transfer syntax as defined by the "Presentation Context Tables" in the following subsections.

4.2.3.4.1 Activity "Receive a Remote Node"

4.2.3.4.1.1 Description and Sequencing of Activities

The ***syngo*® PT Treatment** responds to requests issued by an SCU with the query model: Study Root.

Hierarchical and relational retrieve operations are both supported.

4.2.3.4.1.2 Accepted Presentation Contexts

The ***syngo*® PT Treatment** will accept Presentation Contexts as shown in the following table:

Table 4-45
ACCEPTABLE PRESENTATION CONTEXTS FOR QUERY AE AND ACTIVITY "RECEIVE A REMOTE NODE"

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	Yes
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

Table 4-46
EXTENDED NEGOTIATION AS AN SCP

SOP Class Name	SOP Class UID	Extended Negotiation
Study Root Query/ Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Relational Query will be negotiated if necessary as defined in DICOM PS3.4

4.2.3.4.1.3 SOP Specific Conformance Statement to Query SOP classes

The ***syngo*® PT Treatment** Query AE supports all Query attributes of Table 4-44.

The query attribute contents will be treated case-sensitive except all PN attributes which will always be treated case-insensitive.

The Query AE of the ***syngo*® PT Treatment** does not return any Media File-Set ID or UID, they always return the Retrieve AET (0008,0054). Furthermore, "Instance Availability" (0008,0056) is always returned.

4.2.3.4.1.4 Hierarchical and Relational Queries

Independent of the negotiation for relational queries, each C-FIND request is treated as if it was a relational query. The SCP allows any combination of keys at or above the provided Query/Retrieve level in the hierarchy. Keys below Query/Retrieve level return an error.

But if for example a series level attribute is requested in a study level query, an error will be returned by ***syngo*® PT Treatment** (code “0106”).

4.2.3.4.1.5 Return Codes

Table 4-47
QUERY C-FIND / C-CANCEL RESPONSE STATUS

Service Status	Further Meaning	Error Codes	Reason
Processing failure	Parsing or translation of the DICOM request failed. A response could not be generated. The response could not be sent to the client. The query of the database failed.	C001	Any error during Query in the DataBase
Success	Matching is complete - No final Identifier is supplied	0000	
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Further Worklist Items will be returned;
	Matches are continuing – Warning that one or more Optional Keys were not supported for existance and/or matching for this identifier	FF01	Further Worklist Items will be returned; Some of Required Attributes are not present in the DataBase

The maximum number of matches returned can be configured. The status of the final response will always be SUCCESS whether the clipping occurred or not.

4.2.4 Retrieve AE

4.2.4.1 SOP Classes

This Application Entity provides Standard Conformance to the following SOP Classes:

Table 4-48
SOP CLASSES FOR RETRIEVE AE

SOP Class Name	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)
Supported Query/Retrieve SOP Classes			
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

4.2.4.2 Association Policies

4.2.4.2.1 General

Table 4-49
DICOM APPLICATION CONTEXT

Application Context Name	1.2.840.10008.3.1.1.1

4.2.4.2.2 Number of Associations

Table 4-50:
NUMBER OF ASSOCIATIONS AS AN ASSOCIATION INITIATOR FOR RETRIEVE AE

Maximum number of simultaneous associations	unlimited

Table 4-51:
NUMBER OF ASSOCIATIONS AS AN ASSOCIATION ACCEPTOR FOR RETRIEVE AE

Maximum number of simultaneous associations	*Configurable between 1 and 30, default: 5*

4.2.4.2.3 Asynchronous Nature

The ***syngo*® PT Treatment** supports asynchronous communication (multiple outstanding transactions over a single association). On the SCU side the Window size proposed is infinite. On the SCP Side any non-infinite maximum size will be accepted. By mean of configuration change, it can be possible to have the SCP accept infinite Window size.

Table 4-52:
ASYNCHRONOUS NATURE AS AN ASSOCIATION INITIATOR FOR RETRIEVE AE

Maximum number of outstanding asynchronous transactions	Infinite

4.2.4.2.4 Implementation Identifying Information

Table 4-53
DICOM IMPLEMENTATION CLASS AND VERSION FOR RETRIEVE AE

Implementation Class UID	<NA>
Implementation Version Name	<NA>

4.2.4.3 Association Initiation Policy

The ***syngo*® PT Treatment*** Retrieve AE sends a C-MOVE-RQ to an SCP node to retrieve images

4.2.4.3.1 Activity "Move SCU"

4.2.4.3.1.1 Description and Sequencing of Activities

The C-MOVE-RQs are used to retrieve the referenced images. The Retrieve AE supports the query model Study Root.

4.2.4.3.1.2 Accepted Presentation Contexts

Table 4-54
PROPOSED PRESENTATION CONTEXTS FOR RETRIEVE AE AND ACTIVITY "MOVE SCU"

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Study Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	No

Table 4-55
EXTENDED NEGOTIATION AS AN SCU

There is no extended negotiation as an SCU.

4.2.4.3.1.3 SOP Specific Conformance Statement for Move SCU Classes

At association establishment time the C-MOVE presentation context shall be negotiated. When the C-MOVE-RQ is processed, the Move Destination attribute (receiver of images) is ignored. However the Move Destination AE must conform to the DICOM conventions (value representation AE).

Table 4-56
DICOM COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Error		Any; none; null; Code	Failure reported to user (percentage of transferred instances is shown)
Success		0000	Success reported to user

Table 4-57
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	Failure reported to user (Timeout configurable; default 30s)
Association Aborted	Failure reported to user

4.2.4.4 Association Acceptance Policy

The ***syngo*® PT Treatment** Retrieve AE attempts to accept a new association for

- DIMSE C-MOVE

service operation.

Generally associations are accepted if all of the following conditions are true:

- The "called AET" matches one of the configured Application Entity Titles of the ***syngo*® PT Treatment**. This check can be disabled.
- The "calling AET" is allowed to connect to ***syngo*® PT Treatment**. This check can be disabled.
- The maximum number of incoming associations is not reached.
- At least one Presentation Context has been proposed with at least one suitable transfer syntax as defined by the "Presentation Context Tables" in the following subsections.

4.2.4.4.1 Activity “Move SCP”

4.2.4.4.1.1 Description and Sequencing of Activities

The Retrieve AE responds to retrieve requests of an SCU. The requests are used to retrieve the referenced images. The Retrieve AE supports the query model Study Root.

4.2.4.4.1.2 Accepted Presentation Contexts

Table 4-58
ACCEPTABLE PRESENTATION CONTEXTS FOR RETRIEVE AE AND ACTIVITY "MOVE SCP"

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Study Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	No

Table 4-59
EXTENDED NEGOTIATION AS AN SCP
There is no extended negotiation as an SCP.

4.2.4.4.1.3 SOP Specific Conformance Statement for Move SCP Classes

At association establishment time the C-MOVE presentation context shall be negotiated. When the C-MOVE-RQ is processed, the Move Destination attribute (receiver of images) is ignored. However the Move Destination AE must conform to the DICOM conventions (value representation AE).

The Retrieve AE sends continuously C-MOVE responses to indicate progress about the dearchiving of images.

Table 4-60
C-MOVE-RSP Service Parameters

Attribute	**Meaning**
Number Of Remaining Sub-Operation	Is sent if the C-MOVE-RSP has the status Pending. Indicates the number of images which have not yet been dearchived.
Number Of Completed Sub-Operation	Indicates the number of images which are ONLINE, either if they have been dearchived or were ONLINE before the C-MOVE-RQ was sent.
Number Of Failed Sub-Operation	Number of failing images within the Sending Association
Number Of Warning Sub-Operation	Always 0.

The final C-MOVE-RSP is sent after all images have been dearchived either successfully or unsuccessfully. No C-STORE operations are done in series of a C-MOVE-RQ for the Retrieve AE.

4.2.4.4.1.4 Hierarchical and Relational Queries

Independent of the negotiation for relational queries, each C-FIND request is treated as if it was a relational query. The SCP allows any combination of keys at or above the provided Query/Retrieve level in the hierarchy. Keys below Query/Retrieve level return an error.

But if for example a series level attribute is requested in a study level query, an error will be returned by ***syngo*® PT Treatment** (code "0106").

4.2.4.4.1.5 Return Codes

Table 4-61
RETRIEVE C-MOVE RESPONSE STATUS

Service Status	**Further Meaning**	**Error Code**	**Reason**

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	Image received correctly (success notification is done after receiving, before indexing and storing)
Failure	Out-of-resource	0xA700	Not resource left in the Short Term Storage
Failure	Unable to Process	0xCxxx	Error during instance reception
Failure	DataSet does not match SOP Class	0xA9xx	The DataSet is not conform to the SOP Class contained in the resource.

4.3 NETWORK INTERFACES

4.3.1 Physical Network Interface

The ***syngo*® PT Treatment** is independent from the physical medium over which TCP/IP executes; it inherits this from the OS system upon which it executes.

4.3.2 Additional Protocols

None.

4.3.3 IPv4 and IPv6 Support

IPv4 supported, IPv6 not supported.

4.4 CONFIGURATION

4.4.1 AE Title/Presentation Address Mapping

To ensure unique identification within the network the hostname should be used as part of the AE Titles (see examples below). The string can be up to 16 characters and must not contain any extended characters. Only 7-bit ASCII characters (excluding Control Characters) are allowed according to DICOM [1].

4.4.1.1 Local AE Titles

The ***syngo*® PT Treatment** allows to configure AETitles and Services in any wished way. The strategy used for a certain deployment shall be encoded in a precise Configuration template file which will be used for configuration at system installation time. Relationship between AET and Services are described in that template.

Templates shall be used to describe the system itself and all remote Nodes.

4.4.1.2 Remote AE Title/Presentation Address Mapping

The mapping of external AE Titles to TCP/IP addresses and ports is configurable and set at the time of installation by Installation Personnel. The Application Entity Titles, host names and port numbers of remote nodes are configured using the ***syngo*® PT Treatment** Service software.

The Query SCPs are configured syngo Enterprise Platform wide via the Service Module of the Operation Manager (OPM).

Remote Application Entities can be configured without restarting the process.

4.4.1.2.1 Remote SCP 1

4.4.2 Parameters

The next table lists configuration parameters, which are true for all Application Entities.

Table 4-62
Parameter List

Parameter	Configurable	Default Value
max PDU size	Yes	131072 Bytes
time-out for accepting/rejecting an association request	Yes	60 s
time-out for responding to an association open/close request	Yes	60 s
time-out for accepting a message over network	Yes	60 s
time-out for waiting for data between TCP/IP-packets	Yes	60 s
time-outs for waiting for a Service Request/Response message from the remote node (Storage SCP/SCU)	Yes	600 s
time-outs for waiting for a Service Request/Response message from the remote node (Query/Retrieve SCP/SCU)	Yes	600 s

Parameter	Configurable	Default Value
number of image collection before saving to database	Yes	20
max matches querylimit	Yes	unlimited
max number of parallel associations	Yes	10

5 MEDIA INTERCHANGE

5.1 IMPLEMENTATION MODELS

5.1.1 Application Data Flow Diagram

n.a.

5.1.2 Functional definitions of Aes

n.a.

5.1.3 Sequencing of Real-World Activities

n.a.

5.1.4 File Meta Information for Implementation Class and Version

n.a.

5.2 AE SPECIFICATIONS

n.a.

5.3 AUGMENTED AND PRIVATE APPLICATION PROFILES

n.a.

5.4 MEDIA CONFIGURATION

n.a.

6 SUPPORT OF CHARACTER SETS

6.1 CHARACTER SETS FOR *syngo*® PT Treatment

The ***syngo*® PT Treatment** supports the ISO 8859 Latin 1 (ISO-IR 100) character set.

7 SECURITY

7.1 SECURITY PROFILES

- PS 3.15 Annex F: Network Address Management Profiles: DHCP Client, DNS Client supported
- PS 3.15 Annex G: Time Synchronization Profiles: supported

7.2 ASSOCIATION LEVEL SECURITY

It is possible to configure whether the Dicom Server will only answer to known AETs or to any AET.

7.3 APPLICATION LEVEL SECURITY

- User must login with own password.
- For configuration and Maintenance, Service Technician must login with a separate password.

8 ANNEXES

8.1 IOD CONTENTS

8.1.1 Created SOP Instance(s)

For created SOP instances see sections: 8.7 and 8.8.

8.1.2 Usage of Attributes from received IODs

8.1.2.1 Supported attributes of C-FIND services

Table 8-1
C-Find-Response attributes

Attribute name	Tag	Usage SCU	Matching
Patient Level Attributes			
Patient Name	(0010,0010)	O	single value, wildcard, universal
Patient ID	(0010,0020)	U (Patient Root, Patient/Study only)	single value, wildcard, universal
Patient's Birth Date	(0010,0030)	O	single value, range, universal
Patient's Sex	(0010,0040)	O	single value, wildcard, universal
Other Patient IDs	(0010,1000)	O	single value, wildcard, universal, multiple values
Other Patient Names	(0010,1001)	O	multiple values
Ethnic Group	(0010,2160)	O	single value, wildcard, universal
Patient Comments	(0010,4000)	O	universal
Number of Patient Related Studies	(0020,1200)	return key only	no matching
Number of Patient Related Series	(0020,1202)	return key only	no matching
Number of Patient Related Instances	(0020,1204)	return key only	no matching
Study Level Attributes			
Study Instance UID	(0020,000D)	U	single value, list of UID
Study ID	(0020,0010)	O	single value, wildcard, universal
Study Date	(0008,0020)	O	single value, range, universal
Study Time	(0008,0030)	O	single value, range, universal
Accession Number	(0008,0050)	O	single value, wildcard, universal
Modalities in Study	(0008,0061)	O	universal, single value, multiple value
Referring Physician's Name	(0008,0090)	O	single value, wildcard, universal
Study Description	(0008,1030)	O	single value, wildcard, universal
Procedure Code Sequence	(0008,1032)	O	sequence matching
Number of Study Related Series	(0020,1206)	return key only	no matching
Number of Study Related Instances	(0020,1208)	return key only	no matching
Series Level Attributes			
Series Instance UID	(0020,000E)	U	single value, list of UID
Series Number	(0020,0011)	O	single value, wildcard, universal
Modality	(0008,0060)	O	single value, wildcard, universal
Body Part Examined	(0018,0015)	O	single value, wildcard, universal
Series Date	(0008,0021)	O	single value, range, universal
Series Time	(0008,0031)	O	single value, range, universal

Attribute name	Tag	Usage SCU	Matching
Series description	(0008,103E)	O	single value, wildcard, universal
Number of Series Related Instances	(0020,1209)	return key only	no matching
Performing Physician's Name	(0008,1050)	O	single value, wildcard, universal
Referenced Performed Procedure Sequence	(0008,1111)	O	sequence matching
>Referenced SOP Class UID	(0008,1150)	O	single value, list of UID
>Referenced SOP Instance UID	(0008,1155)	O	single value, list of UID
Performed Procedure Step Start Date	(0040,0244)	O	single value, range, universal
Performed Procedure Step Start Time	(0040,0245)	O	single value, range, universal
Performed Procedure Step ID	(0040,0253)	O	single value, wildcard, universal
Performed Procedure Step Description	(0040,0254)	O	single value, wildcard, universal
Request Attribute Sequence	(0040,0275)	O	sequence matching
>Requested Procedure ID	(0040,1001)	O	single value, wildcard, universal
>Scheduled Procedure Step ID	(0040,0009)	O	single value, wildcard, universal
Instance Level Attributes (The following table is valid for different types of content documents (Images, SRs, GSPS, Key Image Notes). Some attributes are valid only for special instances - the usage is described in the Usage SCU column.)			
SOP Instance UID	(0008,0018)	U	single value, list of UID
SOP Class UID	(0008,0016)	O	single value, list of UID
Content Date	(0008,0023)	O	single value, range, universal
Content Time	(0008,0033)	O	single value, range, universal
Acquisition Number	(0020,0012)	O	single value, universal
Instance Number	(0020,0013)	O	single value, universal
Patient Orientation	(0020,0020)	O	single value, universal
Samples per Pixel	(0028,0002)	O	single value, universal
Photometric Interpretation	(0028,0004)	O	single value, universal
Number of Frames	(0028,0008)	O	single value, universal
Rows	(0028,0010)	O	single value, universal
Columns	(0028,0011)	O	single value, universal
Bits Allocated	(0028,0100)	O	single value, universal
Bits Stored	(0028,0101)	O	single value, universal
Operators' Name	(0008,1070)	query RT ION Plan	single value, universal
RT Plan Label	(300A,0002)	query RT ION Plan	single value, universal
RT Plan Name	(300A,0003)	query RT ION Plan	single value, universal
RT Plan Description	(300A,0004)	query RT ION Plan	single value, universal
RT Plan Date	(300A,0006)	query RT ION Plan	single value, range, universal
RT Plan Time	(300A,0007)	query RT ION Plan	single value, range, universal
Plan Intent	(300A,000A)	query RT ION Plan	single value, universal
Prescription Description	(300A,000E)	query RT ION Plan	single value, universal
Approval Status	(300E,0002)	query RT ION Plan	single value, universal
Completion Flag	(0040,A491)	query SR	single value, universal
Concept Name Code Sequence	(0040,A043)	query SR	sequence
> Code Value	(0008,0100)	query SR	single value, universal
> Code Scheme Designator	(0008,0102)	query SR	single value, universal
> Code Scheme Version	(0008,0103)	query SR	single value, universal
> Code Meaning	(0008,0104)	query SR	single value, universal
Observation Date Time	(0040,A032)	query SR	single value, range, universal

Attribute name	Tag	Usage SCU	Matching
Verifying Observer Sequence	(0040,A073)	query SR	sequence
> Verifying Organization	(0040,A027)	query SR	single value, universal
> Verifying Date Time	(0040,A030)	query SR	single value, universal
> Verifying Observer Name	(0040,A075)	query SR	single value, universal
> Verifying Observer Identification Code Sequence	(0040,A088)	query SR	single value, universal
Referenced Request Sequence	(0040,A370)	query SR	sequence
> Study Instance UID	(0020,000D)	query SR	single value, universal
> Accession Number	(0008,0050)	query SR	single value, universal
> Requested Procedure ID	(0040,1001)	query SR	single value, universal
> Requested Procedure Code Sequence	(0032,1064)	query SR	single value, universal
> Code Value	(0008,0100)	query SR	single value, universal
> Code Scheme Designator	(0008,0102)	query SR	single value, universal
> Code Scheme Version	(0008,0103)	query SR	single value, universal
> Code Meaning	(0008,0104)	query SR	single value, universal
Verification Flag	(0040,A493)	query SR	single value, universal
Content Template Sequence	(0040,A504)	query SR	sequence
>Template Identifier	(0040,DB00)	query SR	single value, universal
Presentation Label	(0070,0080)	query GSPS	single value, universal
Presentation Description	(0070,0081)	query GSPS	single value, universal
Presentation Creation Date	(0070,0082)	query GSPS	single value, range, universal
Presentation Creator's Name	(0070,0084)	query GSPS	single value, universal
Referenced Series Sequence	(0008,1115)	query GSPS	sequence
> Series Instance UID	(0020,000E)	query GSPS	single value, universal, list
> Referenced Image Sequence	(0008,1140)	query GSPS	single value, universal, list
>> Referenced SOP Class UID	(0008,1150)	query GSPS	single value, universal, list
>> Referenced SOP Instance UID	(0008,1155)	query GSPS	single value, universal, list

8.1.2.2 Printer Status Info and Execution Status Info

n.a.

8.1.3 Attribute mapping

n.a.

8.1.4 Coerced / Modified fields

n.a.

8.2 DATA DICTIONARY OF PRIVATE ATTRIBUTES

See section 8.5.1 for Private SIEMENS SOP Classes.

In addition the ***syngo*® PT Treatment** reserves blocks of private attributes in groups defined as per section 8.9.1 where private creator codes are specified. Further details on usage of these private attributes are contained in section 8.8.

8.3 CODED TERMINOLOGY AND TEMPLATES

8.3.1 Context Groups

n.a.

8.3.2 Template Specifications

n.a.

8.3.3 Private Code Definitions

n.a.

8.4 GRAYSCALE IMAGE CONSISTENCY

n.a.

8.5 STANDARD EXTENDED / SPECIALIZED / PRIVATE SOP CLASSES

8.5.1 Private Siemens SOP Classes

Private Data Element Dictionary: CSA HEADER

DICOM Tag	Name	VR	VM	Status
(0029,SIEMENS CSA HEADER,08)	Modality Image Header Type	CS	1	
(0029,SIEMENS CSA HEADER,09)	Modality Image Header Version	LO	1	
(0029,SIEMENS CSA HEADER,10)	Modality Image Header Info	OB	1	
(0029,SIEMENS CSA HEADER,18)	Modality Series Header Type	CS	1	
(0029,SIEMENS CSA HEADER,19)	Modality Series Header Version	LO	1	
(0029,SIEMENS CSA HEADER,20)	Modality Series Header Info	OB	1	

Private Data Element Dictionary: CSA NON-IMAGE

DICOM Tag	Name	VR	VM	Status
(0029,SIEMENS CSA NON-IMAGE,08)	Modality Data Header Type	CS	1	
(0029,SIEMENS CSA NON-IMAGE,09)	Modality Data Header Version	LO	1	
(0029,SIEMENS CSA NON-IMAGE,10)	Modality Data Header Info	OB	1	

Private Data Element Dictionary: MEDCOM HEADER

DICOM Tag	Name	VR	VM	Status
(0029,SIEMENS MEDCOM HEADER,70)	Siemens Link Sequence	SQ	1-n	
(0029,SIEMENS MEDCOM HEADER,71)	Referenced Tag	AT	1	
(0029,SIEMENS MEDCOM HEADER,72)	Referenced Tag Type	CS	1	
(0029,SIEMENS MEDCOM HEADER,73)	Referenced Value Length	UL	1	
(0029,SIEMENS MEDCOM	Referenced Object Device Type	CS	1	

DICOM Tag	Name	VR	VM	Status
HEADER,74)				
(0029,SIEMENS MEDCOM HEADER,75)	Referenced Object Device Location	OB	1	
(0029,SIEMENS MEDCOM HEADER,76)	Referenced Object ID	OB	1	
(0029,SIEMENS MEDCOM HEADER,77)	Referenced Object Offset	UL	1	

Private Data Element Dictionary: SYNGO ADVANCED PRESENTATION

DICOM Tag	Name	VR	VM	Status
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,00)	Presentation Name	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,01)	Presentation Type	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,02)	Advanced Presentation Sequence	SQ	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,03)	Time Point Sequence	SQ	1-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,04)	Base Image Sequence	SQ	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,05)	Overlay Image Sequence	SQ	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,06)	Registration Instance Sequence	SQ	0-1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,07)	Real World Value Mapping Instance Sequence	SQ	0-1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,08)	Measurement Sequence	SQ	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,09)	Measurement UID	UI	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,10)	Segmentation Sequence	SQ	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,11)	Segmentation UID	UI	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,12)	Navigation Sequence	SQ	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,13)	Navigation Name	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,14)	Auto Navigation Direction	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,15)	Auto Navigation Frame Rate	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,16)	Auto Navigation Mode	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,17)	Auto Navigation Realtime Speed	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,18)	Auto Navigation Strategy	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,19)	Auto Navigation Realtime Flag	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,20)	Index Navigation Current Index	IS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,21)	Index Auto Navigation Skipping Degree	IS	1	
(0029,SIEMENS SYNGO ADVANCED	Volume Navigation Minimum	DS	1	

DICOM Tag	Name	VR	VM	Status
PRESENTATION,22)	Pixel Spacing			
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,23)	Volume Navigation Scroll Unit	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,24)	Volume Navigation Step Size	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,25)	Volume Navigation Jump Size	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,26)	Referenced Registration Number	IS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,27)	Real World Value Mapping UID	UI	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,31)	Measurement Data Sequence	SQ	1-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,32)	Measurement Type	LO	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,33)	Measurement Frame of Reference UID	UI	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,35)	Measurement Application Number	IS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,36)	Measurement Application Number Prefix Text	ST	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,41)	Camera Position	DS	3	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,42)	Camera Orientation	DS	4	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,43)	Camera Far Clip Plane	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,44)	Camera Near Clip Plane	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,45)	Camera Thickness	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,46)	Camera ViewPort Size	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,47)	Camera Aspect Ratio	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,48)	Camera Projection Type	LO	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,49)	Camera Field of View	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,4A)	Camera Image Plane Distance	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,4B)	Camera Image Maximum Height	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,4C)	Camera Image Minimum Height	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,4D)	ParallelShift Interval MM	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,4E)	ParallelShift BoundingBox Minimum	DS	3	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,4F)	ParallelShift BoundingBox Maximum	DS	3	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,51)	Renderer Thickness Usage Flag	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,52)	Renderer Threshold	DS	4	

DICOM Tag	Name	VR	VM	Status
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,53)	Renderer Material	DS	4	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,54)	Renderer DirectionalLight Color	DS	4	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,55)	Renderer DirectionalLight Direction	DS	3	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,56)	Renderer DirectionalLight TwoSide Usage Flag	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,57)	Renderer PWL TransferFunction Sequence	SQ	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,58)	Renderer PWL Vertex Index	IS	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,59)	Renderer PWL Vertex Color	DS	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,5A)	Renderer Is Camera Required Flag	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,5B)	Renderer Do Depth Test Flag	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,5C)	Renderer DirectionalLight Usage Flag	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,5D)	Renderer Thickness Sequence	SQ	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,61)	Segmentation Display Data Sequence	SQ	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,62)	Segmentation Display Data UID	UI	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,63)	Segmentation Display Parameter Sequence	SQ	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,64)	Segmentation Display Parameter Type	LO	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,65)	Segmentation Display Visibility	LO	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,66)	Segmentation Display Color	DS	4	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,67)	Segmentation Display Is Selected Flag	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,71)	Registration Referenced Frames	UI	1-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,72)	Registration Referenced Registrations	UI	1-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,81)	Overlay Hidden Display Attributes	SL	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,84)	Camera Rotation Center	DS	3	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,85)	Camera Rotation Center Usage Flag	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,86)	Camera Parallel Epiped	DS	12	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,91)	Measurement Evaluation DataRole Sequence	SQ	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,92)	Measurement Evaluation DataRole Item	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,93)	Measurement Evaluation Sequence	SQ	1-n	
(0029,SIEMENS SYNGO ADVANCED	Measurement Evaluation Value	DS	1	

DICOM Tag	Name	VR	VM	Status
PRESENTATION,94)				
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,95)	Measurement Evaluation ID	CS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,96)	Measurement Data Points	FL	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,97)	Measurement Data Angles	FL	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,98)	Measurement Data Slice	LO	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,99)	Measurement Data Slice Thickness	FL	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,9A)	Measurement Referenced Frames Sequence	SQ	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,9B)	Measurement Evaluation Longest Distance	DS	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,9C)	Measurement Evaluation Centroid	DS	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,9D)	Measurement Data Bounding Box	FL	6	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,A0)	Image Rotation Fractional	DS	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,A6)	Presentation Version Identifier	UI	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,A7)	Presentation Module Sequence	SQ	0-n	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,A8)	Presentation Module Type	LO	1	
(0029,SIEMENS SYNGO ADVANCED PRESENTATION,A9)	Presentation State Sequence	SQ	0-n	

Private Data Element Dictionary: SYNGO DATA PADDING

DICOM Tag	Name	VR	VM	Status
(7FDF,SIEMENS SYNGO DATA PADDING,FC)	Pixel Data Leading Padding	OB	1	

Private Data Element Dictionary: SYNGO FRAME SET

DICOM Tag	Name	VR	VM	Status
(0029,SIEMENS SYNGO FRAME SET,10)	Image Frame Sequence	SQ	1-n	
(0029,SIEMENS SYNGO FRAME SET,12)	Type of Progression	CS	1	
(0029,SIEMENS SYNGO FRAME SET,14)	Representation Level	IS	1	
(0029,SIEMENS SYNGO FRAME SET,16)	Representation Information Sequence	SQ	1-n	
(0029,SIEMENS SYNGO FRAME SET,18)	Number of Representations	IS	1	
(0029,SIEMENS SYNGO FRAME SET,20)	Representation Pixel Offset	IS	1	

Private Data Element Dictionary: SYNGO INDEX SERVICE

DICOM Tag	Name	VR	VM	Status
(0009,SIEMENS SYNGO INDEX SERVICE,20)	Object Insertion Date	DA	1	

Private Data Element Dictionary: SYNGO INSTANCE MANIFEST

DICOM Tag	Name	VR	VM	Status
(0009,SIEMENS SYNGO INSTANCE MANIFEST,00)	Temporary Original Header Sequence	SQ	1	

Private Data Element Dictionary: SYNGO LAYOUT PROTOCOL

DICOM Tag	Name	VR	VM	Status
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,02)	Hanging Protocol Excellence Rank	US	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,06)	Data Sharing Flag	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,08)	Bagging Operations Sequence	SQ	1-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,10)	Synchronization Type	LO	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,12)	Custom Filter Type	LO	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,14)	Custom Sorter Type	LO	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,20)	Selector DT Value	DT	1-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,22)	Selector DA Value	DA	1-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,24)	Selector TM Value	TM	1-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,26)	Selector UI Value	UI	1-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,30)	Custom Property Sequence	SQ	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,32)	Custom Property Type	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,34)	Custom Property Name	LO	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,36)	Custom Property Value	LO	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,38)	Layout Property Sequence	SQ	1-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,40)	Synchronization Sequence	SQ	1-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,50)	Scrollbars Placement	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,52)	Linked Viewports	US	0-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,54)	Viewport Link Target Flag	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,60)	Viewport Definitions Sequence	SQ	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,62)	Protocol Type	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,70)	Display Protocol Name	SH	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,72)	Display Protocol Description	LO	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,74)	Display Protocol Level	CS	1	

DICOM Tag	Name	VR	VM	Status
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,76)	Display Protocol Creator	LO	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,78)	Display Protocol Creation Datetime	DT	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,7A)	Referenced Data Protocol	UI	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,7C)	Display Protocol Excellence Rank	US	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,7E)	Layout Sequence	SQ	1-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,80)	Layout Number	US	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,82)	Layout Description	LO	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,84)	Segment Sequence	SQ	1-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,86)	Segment Number	US	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,88)	Segment Description	LO	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,8A)	Segment Type	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,8C)	Tile Horizontal Dimension	US	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,8E)	Tile Vertical Dimension	US	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,90)	Fill Order	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,92)	Segment Small Scroll Type	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,94)	Segment Small Scroll Amount	US	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,96)	Segment Large Scroll Type	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,98)	Segment Large Scroll Amount	US	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,9A)	Segment Overlap Priority	US	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,9C)	Data Role View Sequence	SQ	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,9E)	Data Role View Number	US	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,A2)	Referenced Data Role	US	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,A4)	Sharing Enabled	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,A8)	Referenced Data Role Views	US	2-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,B0)	Data Protocol Name	SH	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,B2)	Data Protocol Description	LO	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,B4)	Data Protocol Level	CS	1	
(0073,SIEMENS SYNGO LAYOUT	Data Protocol Creator	LO	1	

DICOM Tag	Name	VR	VM	Status
PROTOCOL,B6)				
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,B8)	Data Protocol Creation Datetime	DT	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,BA)	Data Protocol Excellence Rank	US	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,BC)	Data Protocol Definition Sequence	SQ	1-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,BE)	Data Role Sequence	SQ	1-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,C0)	Data Role Number	US	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,C2)	Data Role Name	SH	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,C6)	Selector Operations Sequence	SQ	0-n	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,C8)	Selector Usage Flag	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,CA)	Select by Attribute Presence	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,CC)	Select by Category	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,CE)	Select by Operator	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,D0)	Custom Selector Type	LO	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,D2)	Selector Operator	CS	1	
(0073,SIEMENS SYNGO LAYOUT PROTOCOL,D4)	Reformatting Required	CS	1	

Private Data Element Dictionary: SYNGO PRINT SERVICE

DICOM Tag	Name	VR	VM	Status
(0029,SIEMENS SYNGO PRINT SERVICE,10)	Sheet Number	IS	1	

Private Data Element Dictionary: SYNGO REGISTRATION

DICOM Tag	Name	VR	VM	Status
(0071,SIEMENS SYNGO REGISTRATION,20)	Registered Image Sequence	SQ	1	
(0071,SIEMENS SYNGO REGISTRATION,21)	Registration Is Validated Flag	CS	1	

Private Data Element Dictionary: SYNGO VOLUME

DICOM Tag	Name	VR	VM	Status
(0029,SIEMENS SYNGO VOLUME,12)	Slices	US	1	
(0029,SIEMENS SYNGO VOLUME,14)	Volume Histogram	OB	1	
(0029,SIEMENS SYNGO VOLUME,18)	Volume Level	IS	1	
(0029,SIEMENS SYNGO VOLUME,30)	Voxel Spacing	DS	3	
(0029,SIEMENS SYNGO VOLUME,32)	Volume Position (Patient)	DS	3	
(0029,SIEMENS SYNGO VOLUME,37)	Volume Orientation (Patient)	DS	9	
(0029,SIEMENS SYNGO VOLUME,40)	Resampling Flag	CS	1	

Private Data Element Dictionary: SYNGO TIME POINT SERVICE

DICOM Tag	Name	VR	VM	Status
(0029,SIEMENS SYNGO TIME POINT SERVICE,01)	Time Point ID	LO	1	

8.6 *syngo*® PT Treatment

8.6.1 Introduction

This section specifies in detail software and communication interfaces of the ***syngo*® PT Treatment**.

8.6.2 Software Interfaces

8.6.2.1 SOP UIDs

The UIDs for newly created DICOM instances will be generated following the template:
1.3.12.2.1107.5.15.1.<serial_no><variable part of UID>

8.6.2.2 Extensions to the DICOM Information Object Model

8.6.2.2.1 Additional Patient Information Studies

Typically, there is a set of information objects that globally apply to a patient, regardless of the location of the information in the DICOM data hierarchy. Inside the *syngo* RT system, such global information is stored in studies with Study Description (0008, 1030) “Additional Patient Information”.
Note that it is allowed to have multiple studies containing such global information as long as their description is named accordingly. This avoids the introduction of a global synchronization mechanism when initially creating such a study. Nevertheless, whenever such a study is known to already exist, it should be reused instead of creating a new one.
The following information object instances are stored in this study:

- Fraction Sequence, see 8.6.2.2.3,
- Treatment Course, see 8.6.2.2.4,
- Fraction Sequence Reports,
- Position Corrections, see 8.6.2.2.5,
- Patient Headshot Photos (as Secondary Capture Images),
- Patient Setup Photos (as Secondary Capture Images).

8.6.2.2.2 Other DICOM Studies and Series

Apart from the Additional Patient Information Studies, there are no requirements in which DICOM Studies and Series new instances or instance versions shall be stored. As a consequence, a **global design constraint** must be respected:
No application shall ever make any assumption about finding data to be grouped in specific Studies and Series.
Examples:

- An application working on verification plans shall not expect to find the respective treatment plans in the same plan series as the verification plans.
- An application processing treatment summary records shall not expect to find the respective plans in the same series as the summary records.

The intention is to reduce the number of interface constraints, allowing for easier interoperability.

8.6.2.2.3 Fraction Sequence

Inside the RT Fraction Scheme module of an RT (Ion) Plan, DICOM allows to group beams contained in the plan into fraction groups. For each fraction group, a statement can be made of how many treatment fractions of this group shall be applied. The concept allows to treat only a subset of beams within a given treatment session. The drawback of this concept is twofold:

- Potentially, not all beams that were planned and optimized together could be treated in a treatment session. In this case, the total effective dose would be unknown because of the non linear summation of individual effective doses contributed by the subset of beams irradiated.

- Only beams of a single plan can be grouped. It is not possible to involve beams from multiple plans, which is a must for combined treatments of RT Ion and RT Non Ion Plans.

To overcome this limitation, two decisions were made:

- Inside the fraction group of a plan instance, no subsets of treatment beams are allowed. There must only be a single treatment fraction group, containing all treatment beams in the plan. Note that it is valid to have other fraction groups containing imaging and setup (motion) beams.
- A new information object called *Fraction Sequence* is introduced that allows to group multiple plans for treatment sessions and relate multiple treatment sessions to treatment days. A high level data model is depicted in Figure 5. The object is implemented as a DICOM Structured Report; see 8.10.1. In particular, a Fraction Sequence can group both RT Ion and RT Non Ion Plans together, thus allowing for combined reviews and treatments.

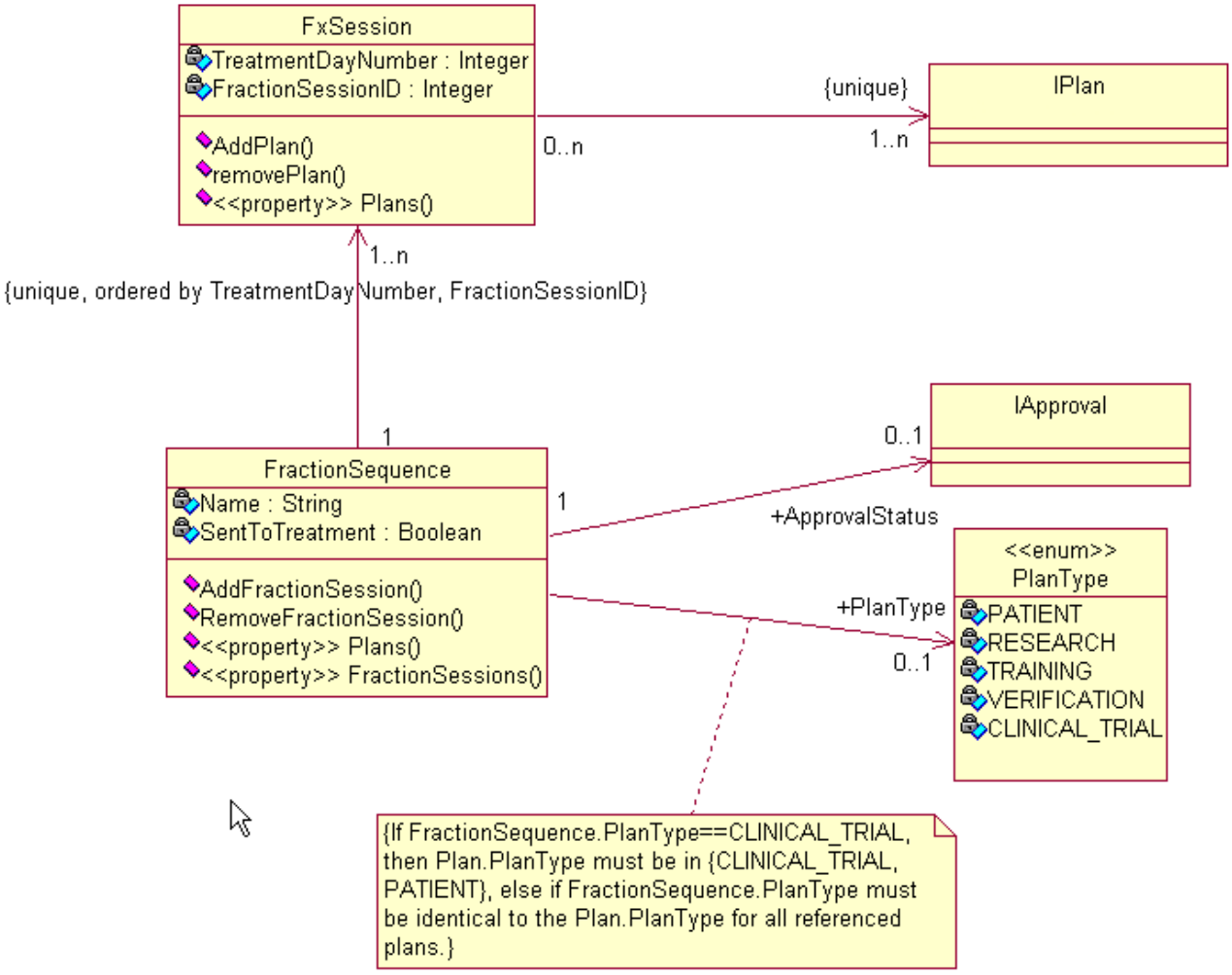


Figure 5: Fraction Sequence high Level Data Model

The Fraction Sequence is a versioned SOP class. Versioning is implemented by the underlying Structured Report. In addition, a Fraction Sequence must be approved before going into treatment delivery.

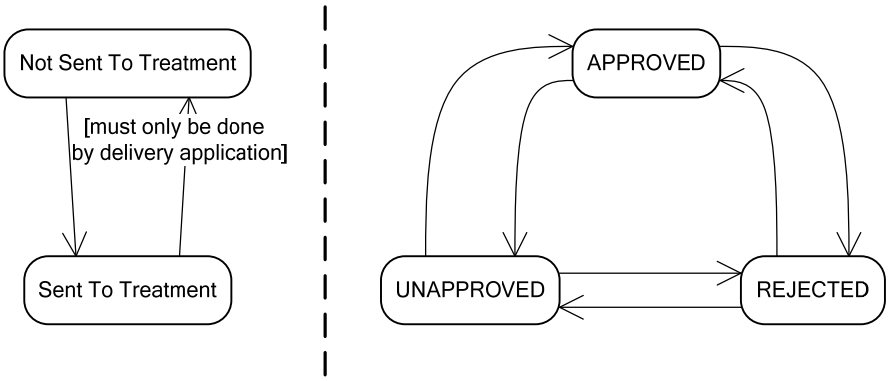


Figure 8-6: States of a Fraction Sequence

A Fraction Sequence which has gone into treatment delivery must never be changed by anybody except the delivery application itself. As a treatment can be ongoing for several weeks, there is a risk that this constraint is not respected. In the absence of global data synchronization in the RT department, a state based locking mechanism has been introduced in the Fraction Sequence instance itself. Besides being approvable, a Fraction Sequence instance can be marked as *Sent to Treatment*. This is depicted in Figure 8-6.
Note that the Sent to Treatment states are conceptually independent from the approval states, the model allows any combination.
Note: the *Rejected* state is not supported.
A Fraction Sequence in state *Not Sent to Treatment* must never be delivered by a treatment delivery application. Once the state is set to *Sent to Treatment* (typically by a planning system), no actor except the treatment delivery application itself may create new versions of the Fraction Sequence. Only if in state *Sent to Treatment*, the Fraction Sequence may be delivered by the treatment delivery application. Once the treatment delivery application has reset the state to *Not Sent to Treatment*, a non treatment delivery application is free to create new versions of the Fraction Sequence. As Fraction Sequences in state APPROVED shall not be modified, the user will first have to explicitly unapprove the Fraction Sequence before creating new working copies.
It is required that inside a Treatment Course in state *ACTIVE*, there must only be a single latest instance version of a Fraction Sequence in state *APPROVED* and which is not yet completely delivered.
Fraction sequence instances are stored in an Additional Patient Information study, see 8.6.2.2

8.6.2.2.4 Treatment Course

In DICOM, there is no possibility to group data relevant for an ongoing treatment. The user has to know which data out of the overall data available for the patient is needed. In order to narrow down the focus to the subset of interest on the data, the Treatment Course was introduced. A Treatment Course is an object containing references to all DICOM objects relevant for the ongoing treatment. An annotation mechanism allows to attach meta-information to individual DICOM instances. A high level data model is implemented as a DICOM Structured Report, see 8.10.3.
A Treatment Course instance can have three states. This is depicted in Figure 8-7.

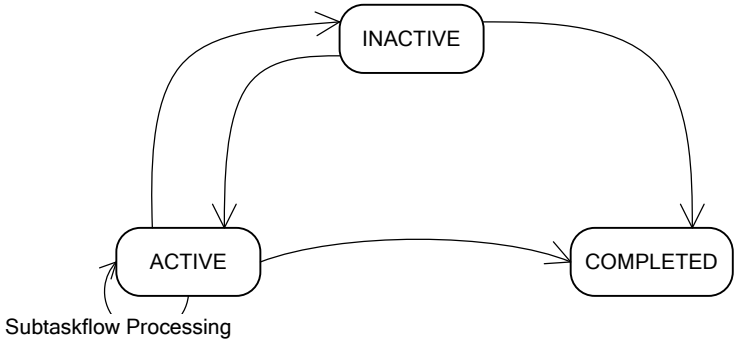


Figure 8-7: Treatment Course State Diagram

There may be multiple versions of Treatment Course instances for a patient, but there must only be one latest version of a Treatment Course in active state. All other versions of Treatment Courses have to be either inactive or completed.
Note: The ***syngo*® PT Treatment** is incomplete with respect to the diagram in Figure 8-7. The system doesn't implement the transitions between the states. A Treatment Course is created in *ACTIVE* state, and is never set to *INACTIVATED* or *COMPLETED*.
The Treatment Course is a versioned SOP class.
Treatment course instances are stored in an Additional Patient Information study, see 8.6.2.2.

8.6.2.2.5 Position Corrections

To be able to store result of position verification (APPLIED or IGNORED) it is introduced a new information object called *Postion Correction*. The object allows to group Fraction Sessions, RT Ion Beams Treatment Record IOD and Spatial Registration IOD and is implemented as a DICOM Structured Report; see 8.10.2.

8.6.2.2.6 Non Human Patients

In some contexts, there is a need of DICOM data which is not associated with a human patient, but rather with some technical device like a water phantom. For such data, the patient last name should be suffixed with "`_non_human`". No application should assume that all non human patients are named in that way. If a patient is named that way, the application can decide to display the related data differently or even suppress it in some contexts.

8.6.2.3 Spatial Registration and Registration Matrix Interpretation

The DICOM specification is not precise about the interpretation of the registration matrix transformation direction. IHE-RO tries to bring more clarity, still the topic is in discussion. On the following figure is shown how registration matrices are defined in a Spatial Registration IOD instance.

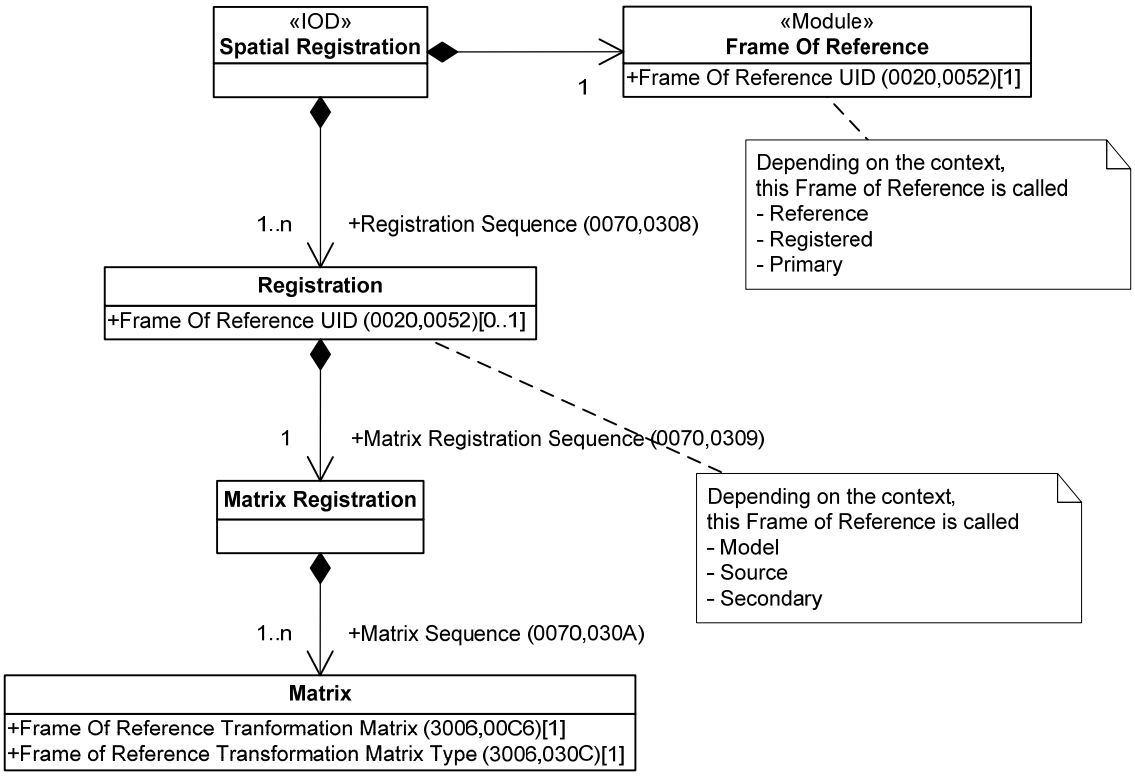


Figure 8-8: Spatial Registration in Context with Frame Of References Class Diagram

Depending on the context, the Frame of Reference of the Spatial Registration IOD itself is called *Reference*, *Registered* or *Primary* Frame of Reference, whereas the Frame of Reference of a Registration inside the Registration Sequence (0070,0308) is called *Model*, *Source* or *Secondary* Frame of Reference respectively.

DICOM allows multiple registration matrices in a single registration. Let $M_i, i = 1..n$ be the individual Frame of Registration Transformation Matrices (3006,00C6) in a Matrix Sequence (0070,030A). The resulting registration matrix is defined as

$$M = \Pi_{i=1}^{n} M_i$$

Let $\vec{x}_{\mathrm{mod}\,el}$ be a point $\vec{x}$ expressed in coordinates of the Model (Source, Secondary) Frame of Reference, and $\vec{x}_{reference}$ the same point $\vec{x}$ expressed in coordinates of the Reference (Registered, Primary) Frame of Reference. The registration matrix is defined such that

$$\vec{x}_{reference} = M \cdot \vec{x}_{\mathrm{mod}\,el}$$

In Figure 8-9, an example sketch is given.

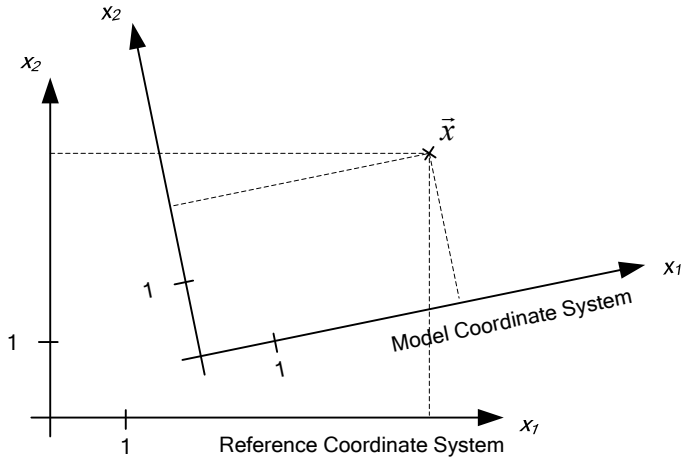


Figure 8-9: Example for Registration Matrix Transformation

The point $\vec{x}$ is located in two coordinate systems. In the model coordinate system, the point is specified by $\vec{x}_{\mathrm{mod}\,el} = (3.4,2.0)$, whereas in the reference coordinate system, the point is specified by $\vec{x}_{reference} = (5.0,3.5)$. The transformation matrix M would be defined such that

$$(5.0,3.5) = M \cdot (3.4,2.0)$$

8.6.2.4 XML based private Attributes

Some of the private attributes have a complex inner structure, which is implemented as XML based string inside the private attribute. The XML schema of such attributes is documented in section 8.11.7.
In the following, a set of rules is defined how to name and structure XML based private attributes. This rule shall apply to all newly defined XML based private attributes. Private attributes already existing as of writing this are not affected by these rules.

8.6.2.4.1 Motivation for XML based private Attributes

The typical way to enrich the DICOM data model with information which is not part of the DICOM standard is to define private attributes (also known as shadow attributes). Although this looks straightforward and simple, it has some drawbacks, especially if heavily used:

- the usage of private attributes reduces interoperability with other vendors,
- the DICOM data gets filled up with non standard attributes,
- private attributes are not - or at least not fully - supported in all software platforms interfacing to DICOM,
- private attributes can get lost during DICOM transfer or storage,
- the value representation of private attributes can get lost during DICOM transfer or storage.

For some of these drawbacks, workarounds can be implemented:

- for the transfer and storage issues, explicit value representation mostly helps,

- reconfiguration of the software platform (i.e. update of merge dictionaries) also sometimes helps, but this leads to conformance questions and the necessity to reconfigure all DICOM nodes involved in a dataflow for each new private attribute.

Provided that private extensions to DICOM cannot be avoided, there is a concept to map all private attributes into a common XML representation. A single private attribute with a global value representation definition, available for all IODs at instance level, can contain all private information as XML instance. The advantages are obvious:

- private extensions are limited to a single attribute, no pollution of DICOM data,
- minimal requirements to software platforms interfacing to DICOM: support for a single private attribute at IOD instance level is sufficient,
- any DICOM conformance redeclaration and reconfiguration needs only to be done once.

The general drawback of private attributes though, the reduced interoperability, is inherent and is not solved here. The private information is simply shifted from many DICOM attributes into a single DICOM attribute containing an XML instance. The data transfer interoperability and software interfacing is improved through this approach. Still, if two applications do not understand their respective private information, they remain non interoperable.
Thus, before introducing new private attributes, it should always be considered:

- Is the private information really needed?
- If so, make sure it is coordinated throughout all the projects and platforms that are affected.

8.6.2.4.2 The Extension Model

The DICOM information object model is mirrored into a family of XML schema, such that for each DICOM IOD an XML schema for private extensions of this IOD is defined. In such a per IOD schema, the outermost element denotes the IOD to be extended. It contains elements denoting the module to be extended, which in turn contains elements denoting (nested) DICOM sequence extensions and finally the private information on attribute level.
It is important to understand that there must be a single global schema per IOD for all extensions in the syngo RT family. It is not valid to maintain individual extensions locally, since this can lead to inconsistent data representations and conflicts.

8.6.2.4.2.1 Name Mapping Rules

DICOM names are not suitable for usage as XML element names. A simple set of transformation rules is used:

- remove the blanks from the DICOM IOD/module/attribute name,
- additionally remove the “Sequence” suffix from DICOM sequence attribute names,
- keep lower and upper case letters as they are.

The result is a name in so called “Camel Notation”, suitable as XML element name. In the following, the transformed name is denoted as name*.

8.6.2.4.2.2 Structure Mapping Rules

The table defines the mapping rules from the DICOM information object model into an XML schema. These rules can be applied recursively, if nested sequences inside modules are subject to private extensions.

DICOM artifact	xs:element type=”…”	xs:element name=”…”	minOccurs	maxOccurs
IOD	xs:complexType enclosing xs:sequence containing elements for module extensions	name*	0	1
Module	xs:complexType enclosing xs:sequence containing elements for • DICOM sequence extensions • private attributes	name*	0	1
Sequence, at any	xs:complexType enclosing	name*	0	1

nesting level, at most one item	xs:sequence containing elements for • nested DICOM Sequence extensions • private attributes			
Sequence, at any nesting level, more than one item	xs:complexType enclosing xs:sequence containing elements for • unique identification of DICOM Sequence item to be extended in order to identify which instance element in the sequence is extended • nested DICOM Sequence extensions • private attributes	name*	0	Unbounded

As a nature of private extensions, they are always optional, even if the module or sequence being extended is mandatory.

8.6.2.4.2.3 Implementation in DICOM

A new private attribute “syngo RT Private Data” VR=UT, VM=1 is added to all IODs on IOD level in one dedicated module. Depending on the IODs SOP Class in which the attribute is used, an XML instance of the schema belonging to the respective IOD is expected.

8.6.3 Communication Interfaces

n.a.

8.7 IODs

8.7.1 Enhanced Structured Report IOD

IE	Module	Usage	Task	Task Usage
Patient	Patient	M		
Study	General Study	M		
Series	SR Document Series	M		
Equipment	General Equipment	M		
Document	SR Document General	M		
	SR Document Content	M		
	SOP Common	M		

8.7.2 RT Beams TxRecord IOD

IE	Module	Usage	Task	Task Usage
Patient	Patient	M		
	Clinical Trial Subject	U		
Study	General Study	M		
	Patient Study	U		
	Clinical Trial Study	U		
Series	RT Series	M		
	Clinical Trial Series	U		
Equipment	General Equipment	M		
Treatment Record	RT General Treatment Record	M		

IE	Module	Usage	Task	Task Usage
	RT Patient Setup	U		
	RT Treatment Machine Record	M		
	Measured Dose Reference Record	U		
	Calculated Dose Reference Record	U		
	RT Beams Session Record	M		
	RT Treatment Summary Record	U		
	SOP Common	M		

8.7.3 RT Dose IOD

IE	Module	Usage	Task	Task Usage
Patient	Patient	M		
	Clinical Trial Subject	U		
Study	General Study	M		
	Patient Study	U		
	Clinical Trial Study	U		
Series	RT Series	M	RTT-PT	Read
	Clinical Trial Series	U		
Frame of Reference	Frame of Reference	M		
Equipment	General Equipment	M		
Dose	General Image	C - Required if dose data contains grid-based doses.		
	Image Plane	C - Required if dose data contains grid-based doses.		
	Image Pixel	C - Required if dose data contains grid-based doses.		
	Multi-Frame	C - Required if dose data contains grid-based doses and pixel data is multi-frame data.		
	Overlay Plane	U		
	Multi-Frame Overlay	U		
	Modality LUT	U		
	RT Dose	M	RTT-PT	Read
	RT DVH	U		
	Structure Set	C - Required if dose data contains dose points or isodose curves	RTT-PT	Read
	ROI Contour	C - Required if dose data contains dose points or isodose curves	RTT-PT	Read
	RT Dose ROI	C - Required if dose data contains dose points or isodose curves	RTT-PT	Read
	SOP Common	M	RTT-PT	Read

8.7.4 RT Image IOD

IE	Module	Usage	Task	Task Usage
Patient	Patient	M		
Study	General Study	M		
Series	RT Series	M	RTT-PT	Read
Equipment	General Equipment	M	RTT-PT	Read
Image	General Image	M	RTT-PT	Read
	Image Pixel	M	RTT-PT	Read
	RT Image	M	RTT-PT	Read
	SOP Common	M	RTT-PT	Read

8.7.5 RT Ion Beams TxRecord IOD

IE	Module	Usage	Task	Task Usage
Patient	Patient	M		
	Clinical Trial Subject	U		
Study	General Study	M		
	Clinical Trial Study	U		
	Patient Study	U		
Series	RT Series	M	RTT-PT	Read Written
	Clinical Trial Series	U		
Equipment	General Equipment	M	RTT-PT	Read Written
Treatment Record	RT General Treatment Record	M	RTT-PT	Read Written
	RT Patient Setup	U	RTT-PT	Used:(Read/Written) RT Patient Setup here makes sense only for relative setup and is thus used only for relative setups to record the relative table displacements.
	RT Treatment Machine Record	M	RTT-PT	Read Written
	Measured Dose Reference Record	U		
	Calculated Dose Reference Record	U	RTT-PT	Read Written
	RT Ion Beams Session Record	M	RTT-PT	Read Written
	RT Treatment Summary Record	U	RTT-PT	Not used: RT Treatment Summary Record is recorded in separate IOD: RT Treatment Summary Record IOD
	SOP Common	M	RTT-PT	Read Written

8.7.6 RT Ion Plan IOD

IE	Module	Usage	Task	Task Usage
Patient	Patient	M		
	Clinical Trial Subject	U		
Study	General Study	M		
	Patient Study	U		
	Clinical Trial Study	U		
Series	RT Series	M	RTT-PT	Read
	Clinical Trial Series	U		
Frame of Reference	Frame of Reference	U – See Note		
Equipment	General Equipment	M	RTT-PT	Read
Plan	RT General Plan	M	RTT-PT	Read Written
	RT Prescription	U	RTT-PT	Read Written
	RT Ion Tolerance Tables	U	RTT-PT	Read
	RT Patient Setup	U	RTT-PT	Read Written
	RT Fraction Scheme	U	RTT-PT	Read Written

IE	Module	Usage	Task	Task Usage
	RT Ion Beams	C – Required if RT Fraction Scheme Module exists and Number of Beams @(300A,0080) is greater than zero for one or more fraction groups	RTT-PT	Read Written (Only for Motion Beam)
	Approval	U	RTT-PT	Read Written
	SOP Common	M	RTT-PT	Read Written

8.7.7 RT Plan IOD

IE	Module	Usage	Task	Task Usage
Patient	Patient	M		
	Clinical Trial Subject	U		
Study	General Study	M		
	Patient Study	U		
	Clinical Trial Study	U		
Series	RT Series	M		
	Clinical Trial Series	U		
Frame of Reference	Frame of Reference	U – See Note.		
Equipment	General Equipment	M		
Plan	RT General Plan	M		
	RT Prescription	U		
	RT Tolerance Tables	U		
	RT Patient Setup	U		
	RT Fraction Scheme	U		
	RT Beams	C - Required if RT Fraction Scheme Module exists and Number of Beams (300A,0080) is greater than zero for one or more fraction groups		
	RT Brachy Application Setups	C - Required if RT Fraction Scheme Module exists and Number of Brachy Application Setups (300A,00A0) is greater than zero for one or more fraction groups		
	Approval	U		
	SOP Common	M		

8.7.8 RT Structure Set IOD

IE	Module	Usage	Comment	Task	Task Usage
Patient	Patient	M			
	Clinical Trial Subject	U			
Study	General Study	M			
	Patient Study	U			
	Clinical Trial Study	U			
Series	RT Series	M		RTT-PT	Read
	Clinical Trial Series	U			
Equipment	General Equipment	M			
Structure Set	Structure Set	M	The Structure Set Module contains a private attribute for an XML based representation of private date inside the Structure Set IOD.	RTT-PT	Read
	ROI Contour	M			
	RT ROI Observations	M			
	Approval	U			
	Audio	U			

IE	Module	Usage	Comment	Task	Task Usage
	SOP Common	M		RTT-PT	Read
Note:	The Audio Module was previously included in this IOD but has been retired. See PS 3.3 2004.				

8.7.9 RT Treatment Summary Record IOD

IE	Module	Usage	Task	Task Usage
IE	Module	Usage		
Patient	Patient	M		
	Clinical Trial Subject	U		
Study	General Study	M		
	Patient Study	U		
	Clinical Trial Study	U		
Series	RT Series	M	RTT-PT	Read Written
	Clinical Trial Series	U		
Equipment	General Equipment	M	RTT-PT	Read Written
Treatment Record	RT General Treatment Record	M	RTT-PT	Read Written
	RT Treatment Summary Record	M	RTT-PT	Read Written
	SOP Common	M	RTT-PT	Read Written

8.7.10 SC Image IOD

IE	Module	Usage	Task	Task Usage
Patient	Patient	M		
	Clinical Trial Subject	U		
Study	General Study	M	RTT-PT	Patient Headshot Photo is put into study "Additional Patient Information"
	Patient Study	U		
	Clinical Trial Study	U		
Series	General Series	M	RTT-PT	Separate Series is maintained for Patient Headshot Photo
	Clinical Trial Series	U		
Equipment	General Equipment	U	RTT-PT	Read Written
	SC Equipment	M		
Image	General Image	M	RTT-PT	Read Written
	Image Pixel	M	RTT-PT	Read Written
	SC Image	M	RTT-PT	Read Written
	Overlay Plane	U		
	Modality LUT	U		
	VOI LUT	U		
	SOP Common	M	RTT-PT	Read Written

8.7.11 Siemens Non Image Private IOD

IE	Module	Usage	Task	Task Usage
Patient	Patient	M		
Study	General Study	M		
	Patient Study	U		
Series	General Series	M		
Equipment	General Equipment	U	RTT-PT	Read Written
CSA	CSA Image Header	U		
	CSA Series Header	U		
	MEDCOM Header	U		
	CSA Non-Image	M	RTT-PT	Read Written
	SOP Common	M	RTT-PT	Read Written

8.7.12 Spatial Registration IOD

IE	Module	Usage	Comment	Task	Task Usage
Patient	Patient	M			
	Specimen Identification	U			
	Clinical Trial Subject	U			
Study	General Study	M			
	Patient Study	U			
	Clinical Trial Study	U			
Series	General Series	M		RTT-PT	Read Written
	Clinical Trial Series	U			
	Spatial Registration Series	M			
Frame of Reference	Frame of Reference	M		RTT-PT	Read Written
Equipment	General Equipment	M		RTT-PT	Read Written
Spatial Registration	Spatial Registration	M	The Spatial Registration Module contains a private attribute for an XML based representation of private date inside the Structure Set IOD.	RTT-PT	Read Written
	Common Instance Reference	M		RTT-PT	Read Written
	SOP Common	M		RTT-PT	Read Written

8.7.13 Spatial Fiducial IOD

IE	Module	Usage	Task	Task Usage
Patient	Patient	M		
	Specimen Identification	U		
	Clinical Trial Subject	U		
Study	General Study	M		
	Patient Study	U		
	Clinical Trial Study	U		
Series	General Series	M		
	Clinical Trial Series	U		
	Spatial Fiducial Series	M		
Equipment	General Equipment	M		

IE	Module	Usage	Task	Task Usage
Spatial Fiducials	Spatial Fiducials	M		
	Common Instance Reference	M		
	SOP Common	M		

8.8 MODULEs

The following table summarizes terms used to describe the usage of DICOM attributes in this section.

Term	Interpretation
Not used	The attribute's value is ignored and not written by the ***syngo*® PT Treatment** when writing the module.
Read	This attribute is read only by the ***syngo*® PT Treatment**.
Modified	This attribute's value is read by the ***syngo*® PT Treatment** and can also be modified by the ***syngo*® PT Treatment**.
Written	This attribute's value is filled with an appropriate value when this attribute is written.

The valid values for an attribute and its mode of use are described within the attribute's description and task usage column. If no description is present, an attribute that is used by ***syngo*® PT Treatment** shall have the same values and interpretation as specified in the DICOM Standard for that attribute.

8.8.1 Approval Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Attribute Checksum Relevance	Task	Task Usage
Approval Status	(300E,0002)	1	CS 1	Approval status at the time the SOP Instance was created. Enumerated Values: APPROVED Reviewer recorded that object met an implied criterion UNAPPROVED No review of object has been recorded REJECTED Reviewer recorded that object failed to meet an implied criterion	Used	RTT-PT	Read. Used for plan approval.
Review Date	(300E,0004)	2C	DA 1	Date on which object was reviewed. Required if Approval Status (300E,0002) is APPROVED or REJECTED.	Used	RTT-PT	Read
Review Time	(300E,0005)	2C	TM 1	Time at which object was reviewed. Required if Approval Status (300E,0002) is APPROVED or REJECTED.	Used	RTT-PT	Read
Reviewer Name	(300E,0008)	2C	PN 1	Name of person who reviewed object. Required if Approval Status (300E,0002) is APPROVED or REJECTED.	Used	RTT-PT	Read
Treatment Approval Sequence	(300B,xx90)	3	SQ 1	This sequence is used to encapsulate the treatment approval information. At most one item may be included in this list.		RTT-PT	Written. Used for Tx approval
>Approval Status	(300E,0002)	1	CS 1	Approval status at the time the SOP Instance was created. Enumerated Values: APPROVED Reviewer recorded that object met an implied criterion UNAPPROVED No review of object has been recorded REJECTED		RTT-PT	Written.

Attribute Name	Tag	Type	VR, VM	Description / Notes	Attribute Checksum Relevance	Task	Task Usage
				Reviewer recorded that object failed to meet an implied criterion			
>Review Date	(300E,0004)	2C	DA 1	Date on which object was reviewed. Required if Approval Status (300E,0002) is APPROVED or REJECTED.		RTT-PT	Modified
>Review Time	(300E,0005)	2C	TM 1	Time at which object was reviewed. Required if Approval Status (300E,0002) is APPROVED or REJECTED.		RTT-PT	Modified
>Reviewer Name	(300E,0008)	2C	PN 1	Name of person who reviewed object. Required if Approval Status (300E,0002) is APPROVED or REJECTED.		RTT-PT	Modified

8.8.2 Calculated Dose Ref Record

Attribute Name	Tag	Type	VR, VM	Description / Notes	Attribute Checksum Relevance	Task	Task Usage
Calculated Dose Reference Sequence	(3008,0070)	1	SQ 1	Introduces sequence of doses estimated for each treatment delivery. The sequence may contain one or more items.	Used	RTT-PT	Written
>Referenced Dose Reference Number	(300C,0051)	1C	IS 1	Uniquely identifies Dose Reference specified by Dose Reference Number (300A, 0012) in Dose Reference Sequence (300A, 0010) in RT Prescription Module of referenced RT Plan. Required only if Calculated Dose Reference Number (3008,0072) is not sent. It shall not be present otherwise.		RTT-PT	Written
>Calculated Dose Reference Number	(3008,0072)	1C	IS 1	Unique identifier of dose reference point within RT Treatment Record IOD. Required if Referenced Dose Reference Number (300C,0051) is not sent; it shall not be present otherwise.			
>Calculated Dose Reference Dose Value	(3008,0076)	2	DS 1	Calculated Dose (Gy). In terms of Effective dose. Sum over all beam in the FG that irradiated in this session.		RTT-PT	Written. Calculated from the delivered control points (that reference this dose reference) of the beam.
>Calculated Dose Reference Description	(3008,0074)	3	ST 1	User-defined description of Calculated Dose Reference.		RTT-PT	Written. This value is picked up from the Dose Reference description of the corresponding dose reference object in the RT prescription module.

8.8.3 Common Instance Reference

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Include Series and Instance Reference Macro				Identifies all Series within the Study of which this Instance is a part, which Series contain Instances that are referenced elsewhere in this Instance.		
Studies Containing Other Referenced Instances Sequence	(0008,1200)	1C	SQ 1	Sequence of items each identifying a Study other than the Study of which this Instance is a part, which Studies contain		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				Instances that are referenced elsewhere in this Instance. One or more Items shall be present. Required if this Instance references Instances in other Studies.		
>Study Instance UID	(0020,000D)	1	UI 1	Unique identifier of the Study containing the referenced Instances.		
>Include Series and Instance Reference Macro						

8.8.4 Contrast Bolus Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Contrast/Bolus Agent	(0018,0010)	2	LO 1	Contrast or bolus agent		
Contrast/Bolus Agent Sequence	(0018,0012)	3	SQ 1	Sequence that identifies the contrast agent. One or more Items may be present.		
>Include 'Code Sequence Macro' Table 8.8-1		Baseline Context ID is 12.				
Contrast/Bolus Route	(0018,1040)	3	LO 1	Administration route of contrast agent		
Contrast/Bolus Administration Route Sequence	(0018,0014)	3	SQ 1	Sequence that identifies the route of administration of contrast agent. Only a single Item shall be permitted in this sequence.		
>Include 'Code Sequence Macro' Table 8.8-1		Baseline Context ID is 11.				
>Additional Drug Sequence	(0018,002A)	3	SQ 1	Sequence that identifies any additional drug that is administered with the contrast agent bolus. One or more Items may be present.		
>>Include 'Code Sequence Macro' Table 8.8-1		No Baseline Context ID is defined.				
Contrast/Bolus Volume	(0018,1041)	3	DS 1	Volume injected in milliliters of diluted contrast agent		
Contrast/Bolus Start Time	(0018,1042)	3	TM 1	Time of start of injection		
Contrast/Bolus Stop Time	(0018,1043)	3	TM 1	Time of end of contrast injection		
Contrast/Bolus Total Dose	(0018,1044)	3	DS 1	Total amount in milliliters of the undiluted contrast agent		
Contrast Flow Rate	(0018,1046)	3	DS 1-n	Rate(s) of injection(s) in milliliters/sec		
Contrast Flow Duration	(0018,1047)	3	DS 1-n	Duration(s) of injection(s) in seconds. Each Contrast Flow Duration value shall correspond to a value of Contrast Flow Rate (0018,1046).		
Contrast/Bolus Ingredient	(0018,1048)	3	CS 1	Active ingredient of agent. Defined Terms: IODINE GADOLINIUM CARBON DIOXIDE BARIUM		
Contrast/Bolus Ingredient Concentration	(0018,1049)	3	DS 1	Milligrams of active ingredient per milliliter of (diluted) agent		

8.8.5 CSA Non Image Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Image Type	(0008,0008)	3	CS 1-n	Image identification characteristics.			
Acquisition Date	(0008,0022)	3	DA 1	The date the acquisition of data that resulted in this data set started.			
Acquisition Time	(0008,0032)	3	TM 1	The time the acquisition of data that resulted in this data set started.			
Conversion Type	(0008,0064)	3	CS 1	Describes the kind of image conversion. Defined Terms:			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				DV = Digitized Video, DI = Digital Interface, DF = Digitized Film, WSD = Workstation.			
Referenced Image Sequence	(0008,1140)	3	SQ 1	A sequence which provides reference to a set of Image SOP Class/Instance identifying other images significantly related to this data set. Encoded as sequence of items: (0008,1150) and (0008,1155).			
Derivation Description	(0008,2111)	3	ST 1	A text description of how this data set was derived.			
Source Image Sequence	(0008,2112)	3	SQ 1	A Sequence which identifies the set of Image SOP Class/Instance pairs of the Images which were used to derive this data set. Zero or more Items may be included in this Sequence. Encoded as sequence of items: (0008,1150) and (0008,1155).			
Patient Position	(0018,5100)	3	CS 1	Patient position descriptor relative to the equipment.			
Acquisition Number	(0020,0012)	3	IS 1	A number identifying the single continuous gathering of data over a period of time which resulted in this data set.			
Instance Number	(0020,0013)	3	IS 1	A number that identifies this data set.			
Frame of Reference UID	(0020,0052)	3	UI 1	Uniquely identifies the frame of reference for a Series.			
Image Comments	(0020,4000)	3	LT 1	User-defined comments about the image.			
Quality Control Image	(0028,0300)	3	CS 1	Indicates whether or not this image is a quality control or phantom image. If this Attribute is absent, then the image may or may not be a quality control or phantom image. Enumerated Values: YES, NO.			
Burned in Annotation	(0028,0301)	3	CS 1	Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired. If this Attribute is absent, then the image may or may not contain burned in annotation. Enumerated Values: YES, NO.			
Lossy Image Compression	(0028,2110)	3	CS 1	Specifies whether an Image has undergone lossy compression. Enumerated Values: 00 = Image has NOT been subjected to lossy compression, 01 = Image has been subjected to lossy compression.			
Lossy Image Compression Ratio	(0028,2112)	3	DS 1-n	Describes the approximate lossy compression ratio(s) that have been applied to this image. May be multi valued if successive lossy compression steps have been applied.			
CSA Data	(0029,xx08)	1	CS 1	CSA Data identification			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Type				characteristics. Defined Terms: BSR REPORT = Study Report Data 3D, EDITOR 3D FLY PATH = Fly Through Data, 3D FLY VRT = Fly Through Data, 3D FUSION MATRIX = Fusion Data, RAW DATA NUM 4 = NUMARIS/ Raw Data, RAW DATA SOM 5 = SOMARIS/ Raw Data, RT3D CONFIG = InSpaceIS Data, SPEC NUM 4 = NUMARIS/4 Spectroscopy, STX MATRIX = 3D Image to STX Frame, STX DSA MATRIX = STX Frame to 2D Image, 3D 2D FUSION MATRIX = 3D to 2D Image			
CSA Data Version	(0029,xx09)	3	LO 1	Version of CSA Data Info (0029,xx10) format and CSA Non-Image Data (7FE1,xx10) format.			
CSA Data Info	(0029,xx10)	3	OB 1	Information to describe the CSA Data (7FE1,xx10).	For a registration context, the XML instance format is defined in SiemensNonImageCSAData.xsd		
CSA Data	(7FE1,xx10)	2	OB 1	Binary data as byte stream.	When the CSA Non Image is used in a registration context, then this attribute contains the text "NODATA".		

8.8.6 Frame of Reference Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Frame of Reference UID	(0020,0052)	1	UI,1	Uniquely identifies the frame of reference for a Series. See PS 3.3 C.7.4.1.1.1 for further explanation.		
Position Reference Indicator	(0020,1040)	2	LO,1	Part of the patient's anatomy used as a reference, such as the iliac crest, orbitalmedial, sternal notch, symphysis pubis, xiphoid, lower coastal margin, external auditory meatus. See PS 3.3 C.7.4.1.1.2 for further explanation.		

8.8.7 General Equipment Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Manufacturer	(0008,0070)	2	LO 1	Manufacturer of the equipment that produced the composite instances.	New implementations shall always write at least “Siemens AG, Healthcare Sector”. If the software is	RTT-PT	Written into records

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
					owned by OCS, then "Siemens AG, Healthcare Sector, Oncology Care Systems" shall be written.		
Institution Name	(0008,0080)	3	LO 1	Institution where the equipment that produced the composite instances is located.		RTT-PT	Written into records
Institution Address	(0008,0081)	3	ST 1	Mailing address of the institution where the equipment that produced the composite instances is located.		RTT-PT	Written into records
Station Name	(0008,1010)	3	SH 1	User defined name identifying the machine that produced the composite instances.		RTT-PT	Written into records
Institutional Department Name	(0008,1040)	3	LO 1	Department in the institution where the equipment that produced the composite instances is located.		RTT-PT	Written into records
Manufacturer's Model Name	(0008,1090)	3	LO 1	Manufacturer's model name of the equipment that produced the composite instances.	If the DICOM SOP instance is created within the context of a syngo.NET Clinical Task (=Subtask), then the name of the Clinical Task shall be written into this attribute. If it is created within the WS infrastructure, then "syngo RT WS" (syngo Classic) or "syngo RT WS.NET" (syngo.NET) shall be written into this attribute.	RTT-PT	Written into records
Device Serial Number	(0018,1000)	3	LO 1	Manufacturer's serial number of the equipment that produced the composite instances.		RTT-PT	Written into records
Software Versions	(0018,1020)	3	LO 1-n	Manufacturer's designation of software version of the equipment that produced the composite instances.	The version of the software application, subsystem or component denoted by Manufacturer's Model Name (0008,1090).	RTT-PT	SW version written into records
Spatial Resolution	(0018,1050)	3	DS 1	The inherent limiting resolution in mm of the acquisition equipment for high contrast objects for the data gathering and reconstruction technique chosen. If variable across the images of the series, the value at the image center.			
Date of Last Calibration	(0018,1200)	3	DA 1-n	Date when the image acquisition device calibration was last changed in any way. Multiple entries may be used for additional calibrations at other times. Date of Last Calibration (0018,1200) and Time of Last Calibration (0018,1201) are used to convey the date and time of calibration. The Attribute Date of Last Calibration (0018,1200) may be supported alone, however, Time of Last			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				Calibration (0018,1201) Attribute has no meaning unless Attribute Date of Last Calibration (0018,1200) is also supported. The order for each Attribute shall be from the oldest date/time to the most recent date/time. When the Attributes are both supported they shall be provided as pairs.			
Time of Last Calibration	(0018,1201)	3	TM 1-n	Time when the image acquisition device calibration was last changed in any way. Multiple entries may be used. Date of Last Calibration (0018,1200) and Time of Last Calibration (0018,1201) are used to convey the date and time of calibration. The Attribute Date of Last Calibration (0018,1200) may be supported alone, however, Time of Last Calibration (0018,1201) Attribute has no meaning unless Attribute Date of Last Calibration (0018,1200) is also supported. The order for each Attribute shall be from the oldest date/time to the most recent date/time. When the Attributes are both supported they shall be provided as pairs.			
Pixel Padding Value	(0028,0120)	3	US/ SS 1	Value of pixels added to non-rectangular image to pad to rectangular format. Note: The Value Representation of this Attribute is determined by the value of Pixel Representation (0028,0103). Pixel Padding Value (0028,0120) is used to pad non-rectangular images to rectangle format. The native format of some images is not rectangular. It is common for devices with this format to pad the images to the rectangular format required by the DICOM Standard with a specific pixel value that is not contained in the native image. This attribute specifies the value of this padding value. Note: 1. When the relationship between pixel value and X-Ray Intensity is unknown, it is recommended that the following values be used to pad with black: 0 if Photometric Interpretation (0028,0004) is MONOCHROME2. 2**BitsStored minus 1 if Photometric Interpretation (0028,0004) is			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				MONOCHROME1. 2. When the relationship between pixel value and X-Ray Intensity is known (for example as defined by Pixel Intensity Relationship (0028,1040) and Pi			

8.8.8 General Image Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Instance Number	(0020,0013)	2	IS 1	A number that identifies this image. Note: This Attribute was named Image Number in earlier versions of this Standard.		RTT-PT	SC Image: not used
Patient Orientation	(0020,0020)	2C	CS 2	Patient direction of the rows and columns of the image. Required if image does not require Image Orientation (Patient) (0020,0037) and Image Position (Patient) (0020,0032). Note: IOD's may have attributes other than Patient Orientation, Image Orientation, or Image Position (Patient) to describe orientation in which case this attribute will be zero length. The Patient Orientation (0020,0020) relative to the image plane shall be specified by two values that designate the anatomical direction of the positive row axis (left to right) and the positive column axis (top to bottom). The first entry is the direction of the rows, given by the direction of the last pixel in the first row from the first pixel in that row. The second entry is the direction of the columns, given by the direction of the last pixel in the first column from the first pixel in that column. Anatomical direction shall be designated by the capital letters: A (anterior), P (posterior), R (right), L (left), H (head), F (foot). Each value of the or			
Content Date	(0008,0023)	2C	DA 1	The date the image pixel data creation started. Required if image is part of a series in which the images are temporally related. Note: This Attribute was formerly known as Image Date.		RTT-PT	SC Image: not used
Content Time	(0008,0033)	2C	TM 1	The time the image pixel data creation started. Required if image is part of a series in which the images		RTT-PT	SC Image: not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				are temporally related. Note: This attribute was formerly known as Image Time.			
Image Type	(0008,0008)	3	CS 1-n	Image identification characteristics. The Image Type (0008,0008) Attribute identifies important image identification characteristics. These characteristics are: a. Pixel Data Characteristics 1. is the image an ORIGINAL Image; an image whose pixel values are based on original or source data 2. is the image a DERIVED Image; an image whose pixel values have been derived in some manner from the pixel value of one or more other images b. Patient Examination Characteristics 1. is the image a PRIMARY Image; an image created as a direct result of the Patient examination 2. is the image a SECONDARY Image; an image created after the initial Patient examination c. Modality Specific Characteristics d. Implementation specific identifiers; other implementation specific identifiers shall be documented in an implementation's conformance statement. The Image Type attribute is multi-valued and shall be provided in the following manner: a. Value 1 shall identify the Pixel Data Characteristics. Enumerated Values for the Pixe			
Acquisition Number	(0020,0012)	3	IS 1	A number identifying the single continuous gathering of data over a period of time that resulted in this image.		RTT-PT	SC Image: modified
Acquisition Date	(0008,0022)	3	DA 1	The date the acquisition of data that resulted in this image started.		RTT-PT	SC Image: modified
Acquisition Time	(0008,0032)	3	TM 1	The time the acquisition of data that resulted in this image started		RTT-PT	SC Image: modified
Acquisition Datetime	(0008,002A)	3	DT 1	The date and time that the acquisition of data that resulted in this image started. Note: The synchronization of this time with an external clock is specified in the Synchronization Module in Acquisition Time Synchronized (0018,1800).			
Expire DateTime	(300B,xxA0)	3	DT 1	The Date and time at which		RTT-PT	SC Image:

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				this image shall be considered 'outdated'.			modified
Referenced Image Sequence	(0008,1140)	3	SQ 1	A sequence which references other images significantly related to this image (for example post-localizer CT image or Mammographic biopsy images or partial view images). One or more Items may be included in this sequence.			
>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class.			
>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance.			
>Referenced Frame Number	(0008,1160)	3	IS 1-n	References one or more image frames of a Multi-Frame Image SOP Instance, identifying which frames are significantly related to this image, and the reference is not to all frames. Note: If this Attribute is not present, all frames of the SOP Instance are referenced.			
>Purpose of Reference Code Sequence	(0040,A170)	3	SQ 1	Describes the purpose for which the reference is made. Only a single Item shall be permitted in this sequence.			
>>Include 'Code Sequence Macro'				Defined Context ID is CID 7201			
Derivation Description	(0008,2111)	3	ST 1	A text description of how this image was derived. If an Image is identified to be a derived image (compare Image Type), Derivation Description (0008,2111)and Derivation Code Sequence (0008,9215) describe the way in which the image was derived. They may be used whether or not the Source Image Sequence (0008,2112) is provided. They may also be used in cases when the Derived Image pixel data is not significantly changed from one of the source images and the SOP Instance UID of the Derived Image is the same as the one used for the source image. Notes: 1. Examples of Derived Images which would normally be expected to affect professional interpretation and would thus have a new UID include: a. images resulting from image processing of another image (for example unsharp masking), b. a multiplanar reformatted			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				CT image, c. a DSA image derived by subtracting pixel values of one image from another. d. an image that has been decompressed after having been compressed with a lossy compression algorithm. To ensure that			
Derivation Code Sequence	(0008,9215)	3	SQ 1	A coded description of how this image was derived. See notes for Derivation Description for further explanation.			
>Include 'Code Sequence Macro'				Defined Context ID is CID 7203			
Source Image Sequence	(0008,2112)	3	SQ 1	A Sequence that identifies the set of Image SOP Class/Instance pairs of the Images that were used to derive this Image. Zero or more Items may be included in this Sequence. If an Image is identified to be a Derived image (compare Image Type), Source Image Sequence (0008,2112) is an optional list of Referenced SOP Class UID (0008,1150)/Referenced SOP Instance UID (0008,1150) pairs which identify the source images used to create the Derived image. It may be used whether or not there is a description of the way the image was derived in Derivation Description (0008,2111) or Derivation Code Sequence (0008,9215).	This attribute is used for maintaining the versioning relationship between images in the syngo RT context. Note that branching version chains is technically possible using this attribute, but it is forbidden in syngo RT.		
>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Source Image Sequence (0008,2112) is sent.			
>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Source Image Sequence (0008,2112) is sent.			
>Referenced Frame Number	(0008,1160)	3	IS 1-n	References one or more image frames of a Multi-Frame Image SOP Instance, identifying which frames were used to derive this image, and the reference is not to all frames. Note: If this Attribute is not present, all frames of the SOP Instance are referenced.			
>Purpose of Reference Code Sequence	(0040,A170)	3	SQ 1	Describes the purpose for which the reference is made, that is what role the source image or frame(s) played in the derivation of this image.			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				Only a single Item shall be permitted in this sequence.			
>>Include 'Code Sequence Macro'				Defined Context ID is CID 7202			
Images in Acquisition	(0020,1002)	3	IS 1	Number of images that resulted from this acquisition of data.			
Image Comments	(0020,4000)	3	LT 1	User-defined comments about the image.			
Quality Control Image	(0028,0300)	3	CS 1	Indicates whether or not this image is a quality control or phantom image. Enumerated Values: YES NO If this Attribute is absent, then the image may or may not be a quality control or phantom image.			
Burned In Annotation	(0028,0301)	3	CS 1	Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired. Enumerated Values: YES NO If this Attribute is absent, then the image may or may not contain burned in annotation.			
Lossy Image Compression	(0028,2110)	3	CS 1	Specifies whether an Image has undergone lossy compression. Enumerated Values: 00 Image has NOT been subjected to lossy compression 01 Image has been subjected to lossy compression See note below for further explanation.			
Lossy Image Compression Ratio	(0028,2112)	3	DS 1-n	Describes the approximate lossy compression ratio(s) that have been applied to this image. May be multivalued if successive lossy compression steps have been applied. Notes: 1. For example, a compression ratio of 30:1 would be described in this Attribute with a single value of 30. 2. For historical reasons, the lossy compression ratio may also be described in Derivation Description (0008,2111). See note below for further explanation.			
Lossy Image Compression Method	(0028,2114)	3	CS 1-n	A label for the lossy compression method(s) that have been applied to this image. The Defined Terms for Lossy Image Compression Method (0028,2114) are:			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				ISO_10918_1 JPEG Lossy Compression ISO_14495_1 JPEG-LS Near-lossless Compression ISO_15444_1 JPEG 2000 Irreversible Compression ISO_13818_2 MPEG2 Compression May be multivalued if successive lossy compression steps have been applied; the value order shall correspond to the values of Lossy Image Compression Ratio (0028,2112). Note: For historical reasons, the lossy compression method may also be described in Derivation Description (0008,2111). See note below for further explanation.			
Referenced Waveform Sequence	(0008,113A)	3	SQ 1	References to waveforms acquired in conjunction with this image. These Waveforms may or may not be temporally synchronized with this image. One or more Items may be included in this sequence.			
>Include 'SOP Instance Reference Macro'							
>Purpose of Reference Code Sequence	(0040,A170)	1	SQ 1	Code describing the purpose of the reference to the waveform(s). Only a single Item shall be permitted in this sequence.			
>>Include 'Code Sequence Macro'				Defined Context ID is CID 7004			
Icon Image Sequence	(0088,0200)	3	SQ 1	This icon image is representative of the Image. An Icon Image may be used as a key representative of an Image. It is defined as a Sequence which contains a single Item encapsulating the Data Set made of the Data Elements of the Icon Image. The Data Elements are defined by the Image Pixel Macro. The restrictions defined in Section Icon Image Key Definition shall apply.			
>Include 'Image Pixel Macro'							
Presentation LUT Shape	(2050,0020)	3	CS 1	When present, specifies an identity transformation for the Presentation LUT such that the output of all grayscale transformations, if any, are defined to be in P-Values. Enumerated Values: IDENTITY output is in P-Values - shall be used if Photometric Interpretation (0028,0004) is MONOCHROME2 or any			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				color photometric interpretation INVERSE output after inversion is in PValues - shall be used if Photometric Interpretation (0028,0004) is MONOCHROME1 When this attribute is used with a color photometric interpretation then the luminance component is in P-Values.			

8.8.9 General Series Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Modality	(0008,0060)	1	CS 1	Type of equipment that originally acquired the data used to create the images in this Series. Defined Terms: AS - Angioscopy (retired) AU - Audio BI - Biomagnetic imaging CD - Color flow Doppler CF - Cinefluorography (retired) CP - Culposcopy (retired) CR - Computed Radiography CS - Cystoscopy (retired) CT - Computed Tomography DD - Duplex Doppler DF - Digital fluoroscopy (retired) DG - Diaphanography DM - Digital microscopy (retired) DS - Digital Subtraction Angiography (retired) DX - Digital Radiography IO - Intra-oral Radiography IVUS - Intravascular Ultrasound EC - Echocardiography (retired) ECG - Electrocardiography EPS - Cardiac Electrophysiology ES - Endoscopy FA - Fluorescein angiography (retired) FS - Fundoscopy (retired) HC - Hard Copy HD - Hemodynamic Waveform LP - Laparoscopy (retired) LS - Laser surface scan MA - Magnetic resonance angiography (retired) MR - Magnetic Resonance (incorporates the retired modalities MA and MS) MS - Magnetic resonance spectroscopy (retired) MG - Mammography NM - Nuclear Medicine OT - Other PR - Presentation State PT - Positron emission		
Series Instance UID	(0020,000E)	1	UI 1	Unique identifier of the Series.	RTT-PT	Written by Position Verification in RTImage
Series Number	(0020,0011)	2	IS 1	A number that identifies this Series.	RTT-PT	Written by Position Verification in RTImage
Laterality	(0020,0060)	2C	CS 1	Laterality of (paired) body part examined. Enumerated Values: R right L left Required if the body part examined is a paired		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				structure and Image Laterality (0020,0062) or Frame Laterality (0020,9072) are not sent. Note: Some IODs support Image Laterality (0020,0062) at the Image level or Frame Laterality (0020,9072) at the Frame level in the Frame Anatomy functional group macro, which can provide a more comprehensive mechanism for specifying the laterality of the body part(s) being examined.		
Series Date	(0008,0021)	3	DA 1	Date the Series started.		
Series Time	(0008,0031)	3	TM 1	Time the Series started.		
Performing Physician's Name	(0008,1050)	3	PN 1-n	Name of the physicians administering the Series.		
Protocol Name	(0018,1030)	3	LO 1	User-defined description of the conditions under which the Series was performed. Note: This attribute conveys series-specific protocol identification and may or may not be identical to the one presented in the Performed Protocol Code Sequence (0040,0260).		
Series Description	(0008,103E)	3	LO 1	User provided description of the Series.	RTT-PT	Written by Position Verification in RTImage
Operators' Name	(0008,1070)	3	PN 1-n	Names(s) of the operator(s) supporting the Series.		
Operator Identification Sequence	(0008,1072)	3	SQ 1	Identification of the operator(s) supporting the Series. One or more items shall be included in this sequence. If more than one Item, the number and order shall correspond to the value of Operator's Name (0008,1070), if present.		
>Include 'Person Identification Macro'						
Referenced Performed Procedure Step Sequence	(0008,1111)	3	SQ 1	Uniquely identifies the Performed Procedure Step SOP Instance to which the Series is related (e.g. a Modality or General-Purpose Performed Procedure Step SOP Instance or Study Component SOP Instance). The Sequence shall have zero or one Item.		
>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced Performed Procedure Step Sequence (0008,1111) is sent.		
Performing Physician Identification Sequence	(0008,1052)	3	SQ 1	Identification of the physician(s) administering the Series. One or more items shall be included in this sequence. If more than one Item, the number and order shall correspond to the value of Performing Physician's Name (0008,1050), if present.		
>Include 'Person Identification Macro'						
>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced Performed Procedure Step Sequence (0008,1111) is sent.		
Related Series Sequence	(0008,1250)	3	SQ 1	Identification of Series significantly related to this Series. Zero or more Items may be present. Notes: 1. For example, for a combined CT and PET acquisition, the CT images and PET images would be in separate series that could cross-reference each other with multiple purpose of reference codes meaning same anatomy, simultaneously acquired and same indication. 2. The related series may have different		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				Frames of Reference and hence require some sort of registration before spatial coordinates can be directly compared. 3. This attribute is not intended for conveying localizer reference information, for which Referenced Image Sequence (0008,1140) should be used.		
>Study Instance UID	(0020,000D)	1	UI 1	Instance UID of Study to which the related Series belongs.		
>Series Instance UID	(0020,000E)	1	UI 1	Instance UID of Related Series.		
>Purpose of Reference Code Sequence	(0040,A170)	2	SQ 1	Sequence Describes the purpose for which the reference is made. Zero or more Items may be present. When absent, implies that the reason for the reference is unknown.		
>>Include 'Code Sequence Macro'				DCID 7210		
Body Part Examined	(0018,0015)	3	CS 1	Text description of the part of the body examined. Defined Terms: SKULL CSPINE TSPINE LSPINE SSPINE COCCYX CHEST CLAVICLE BREAST ABDOMEN PELVIS HIP SHOULDER ELBOW KNEE ANKLE HAND FOOT EXTREMITY HEAD HEART NECK LEG ARM JAW Note: Some IODs support the Anatomic Region Sequence (0008,2218) at the Image level, which can provide a more comprehensive mechanism for specifying the body part being examined.		
Patient Position	(0018,5100)	2C	CS 1	Patient position descriptor relative to the equipment. Defined Terms: HFP Head First-Prone HFS Head First-Supine HFDR Head First-Decubitus Right HFDL Head First-Decubitus Left FFDR Feet First-Decubitus Right FFDL Feet First-Decubitus Left FFP Feet First-Prone FFS Feet First-SupineRequired if CT or MR images; shall not be present if Patient Orientation Code Sequence (0054,0410) is		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				present; may be present otherwise. Patient Position (0018,5100) specifies the position of the patient relative to the imaging equipment space. This attribute is intended for annotation purposes only. It does not provide an exact mathematical relationship of the patient to the imaging equipment. When facing the front of the imaging equipment, Head First is defined as the patient's head being positioned toward the front of the imaging equipment. Feet First is defined as the patient's feet being positioned toward the front of the imaging equipment. Prone is defined as the patient's face being positioned in a downwards (gravity) directi		
Smallest Pixel Value in Series	(0028,0108)	3	US/SS 1	The minimum value of all images in this Series.		
Largest Pixel Value in Series	(0028,0109)	3	US/SS 1	The maximum value of all images in this Series.		
Request Attributes Sequence	(0040,0275)	3	SQ 1	Sequence that contains attributes from the Imaging Service Request. The sequence may have one or more Items.		
>Requested Procedure ID	(0040,1001)	1C	SH 1	Identifier which identifies the Requested Procedure in the Imaging Service Request. Required if Sequence Item is present.		
>Reason for the Requested Procedure	(0040,1002)	3	LO 1	Reason for requesting this imaging procedure.		
>Reason for Requested Procedure Code Sequence	(0040,100A)	3	SQ 1	Coded Reason for requesting this procedure.		
>>Include 'Code Sequence Macro'				No Baseline Context ID is defined.		
>Scheduled Procedure Step ID	(0040,0009)	1C	SH 1	Identifier which identifies the Scheduled Procedure Step. Required if Sequence Item is present.		
>Scheduled Procedure Step Description	(0040,0007)	3	LO 1	Institution-generated description or classification of the Scheduled Procedure Step to be performed.		
>Scheduled Protocol Code Sequence	(0040,0008)	3	SQ 1	Sequence describing the Scheduled Protocol following a specific coding scheme. This sequence contains one or more Items.		
>>Include 'Code Sequence Macro'				No Baseline Context ID is defined.		
>>Protocol Context Sequence	(0040,0440)	3	SQ 1	Sequence that specifies the context for the Scheduled Protocol Code Sequence Item. One or more items may be included in this sequence.		
>>>Include 'Content Item Macro'				No Baseline Context ID is defined.		
>>>Content Item Modifier Sequence	(0040,0441)	3	SQ 1	Sequence that specifies modifiers for a Protocol Context Content Item. One or more items may be included in this sequence. See Module Scheduled Procedure Step.		
>>>>Include 'Content Item Macro'				No Baseline Context ID is defined.		
Performed Procedure Step ID	(0040,0253)	3	SH 1	User or equipment generated identifier of that part of a Procedure that has been carried out within this step.		
Performed Procedure Step Start Date	(0040,0244)	3	DA 1	Date on which the Performed Procedure Step started.		
Performed Procedure Step Start Time	(0040,0245)	3	TM 1	Time on which the Performed Procedure Step started.		
Performed Procedure Step Description	(0040,0254)	3	LO 1	Institution-generated description or classification of the Procedure Step that was performed.		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Performed Protocol Code Sequence	(0040,0260)	3	SQ 1	Sequence describing the Protocol performed for this Procedure Step. One or more Items may be included in this Sequence.		
>Include 'Code Sequence Macro'				No Baseline Context ID is defined.		
>Protocol Context Sequence	(0040,0440)	3	SQ 1	Sequence that specifies the context for the Scheduled Protocol Code Sequence Item. One or more items may be included in this sequence.		
>>Include 'Content Item Macro'				No Baseline Context ID is defined.		
>>Content Item Modifier Sequence	(0040,0441)	3	SQ 1	Sequence that specifies modifiers for a Protocol Context Content Item. One or more items may be included in this sequence. See Module Scheduled Procedure Step.		
>>>Include 'Content Item Macro'				No Baseline Context ID is defined.		
Comments on the Performed Procedure Steps	(0040,0280)	3	ST 1	User-defined comments on the Performed Procedure Step.		

8.8.10 General Study Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Study Instance UID	(0020,000D)	1	UI 1	Unique identifier for the Study.	RTT-PT	Modified
Study Date	(0008,0020)	2	DA 1	Date the Study started.		
Study Time	(0008,0030)	2	TM 1	Time the Study started.		
Referring Physician's Name	(0008,0090)	2	PN 1	Patient's referring physician	RTT-PT	Modified
Referring Physician Identification Sequence	(0008,0096)	3	SQ 1	Identification of the patient's referring physician. Only a single item shall be permitted in this sequence.		
>Include 'Person Identification Macro'						
Study ID	(0020,0010)	2	SH 1	User or equipment generated Study identifier.		
Accession Number	(0008,0050)	2	SH 1	A RIS generated number which identifies the order for the Study.		
Study Description	(0008,1030)	3	LO 1	Institution-generated description or classification of the Study (component) performed.	RTT-PT	Modified
Physician(s) of Record	(0008,1048)	3	PN 1-n	Name(s) of the physician(s) who are responsible for overall patient care at time of Study. Compare Section General Series for Performing Physician in [].	RTT-PT	Modified
Physician(s) of Record Identification Sequence	(0008,1049)	3	SQ 1	Identification of the physician(s) who are responsible for overall patient care at time of Study. One or more items shall be included in this sequence. If more than one Item, the number and order shall correspond to the value of Physician(s) of Record (0008,1048), if present.		
>Include 'Person Identification Macro'						
Name of Physician(s) Reading Study	(0008,1060)	3	PN 1-n	Name(s) of the physician(s) reading the Study.		
Physician(s) Reading Study Identification Sequence	(0008,1062)	3	SQ 1	Identification of the physician(s) reading the Study. One or more items shall be included in this sequence. If more than one Item, the number and order shall correspond to the value of Name of Physician(s) Reading Study		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				(0008,1060), if present.		
>Include 'Person Identification Macro'						
Referenced Study Sequence	(0008,1110)	3	SQ 1	A sequence which provides reference to a Study SOP Class/Instance pair. The sequence may have zero or more Items.		
>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced Study Sequence (0008,1110) is sent.		
>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced Study Sequence (0008,1110) is sent.		
Procedure Code Sequence	(0008,1032)	3	SQ 1	A Sequence that conveys the type of procedure performed. One or more items may be included in this Sequence.		
>Include 'Code Sequence Macro'						

8.8.11 Image Pixel Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Samples per Pixel	(0028,0002)	1	US 1	Number of samples (planes) in this image. See Samples Per Pixel in [] for further explanation.	RTT-PT	RT Image:Read SC Image:Written
Photometric Interpretation	(0028,0004)	1	CS 1	Specifies the intended interpretation of the pixel data. Defined Terms: MONOCHROME1 MONOCHROME2 PALETTE COLOR RGB YBR_FULL YBR_FULL_422 YBR_PARTIAL_422 YBR_PARTIAL_420 YBR_RCT YBR_ICT See Photometric Interpretation in [] for further explanation.	RTT-PT	RT Image:Read SC Image:Written
Rows	(0028,0010)	1	US 1	Number of rows in the image.	RTT-PT	RT Image:Read SC Image:Written
Columns	(0028,0011)	1	US 1	Number of columns in the image	RTT-PT	RT Image:Read SC Image:Written
Bits Allocated	(0028,0100)	1	US 1	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. See PS 3.5 for further explanation.	RTT-PT	RT Image:Read SC Image:Written
Bits Stored	(0028,0101)	1	US 1	Number of bits stored for each pixel sample. Each sample shall have the same number of bits stored. See PS 3.5 for further explanation.	RTT-PT	RT Image:Read SC Image:Written
High Bit	(0028,0102)	1	US 1	Most significant bit for pixel sample data. Each sample shall have the same high bit. See PS 3.5 for further explanation.	RTT-PT	RT Image:Read SC Image:Written
Pixel Representation	(0028,0103)	1	US 1	Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values:	RTT-PT	RT Image:Read SC Image:Written

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				0000H unsigned integer 0001H 2's complement		
Pixel Data	(7FE0,0010)	1	OB/OW 1	A data stream of the pixel samples that comprise the Image. See Pixel Data in [] for further explanation.	RTT-PT	RT Image:Read SC Image:Written
Planar Configuration	(0028,0006)	1C	US 1	Indicates whether the pixel data are sent color-by-plane or color-by-pixel. Enumerated Values: 000 color-by-pixel 001 color-by-plane Required if Samples per Pixel (0028,0002) has a value greater than 1. See Planar Configuration in [] for further explanation.	RTT-PT	SC Image:Written
Pixel Aspect Ratio	(0028,0034)	1C	IS 2	Ratio of the vertical size and horizontal size of the pixels in the image specified by a pair of integer values where the first value is the vertical pixel size, and the second value is the horizontal pixel size. Required if the aspect ratio is not 1\1 and the Image Plane Module or the Pixel Measures Macro is not applicable to this Image. See Pixel Aspect Ratio in [].		
Smallest Image Pixel Value	(0028,0106)	3	US/SS 1	The minimum actual pixel value encountered in this image.		
Largest Image Pixel Value	(0028,0107)	3	US/SS 1	The maximum actual pixel value encountered in this image.		
Red Palette Color Lookup Table Descriptor	(0028,1101)	1C	US/SS 3	Specifies the format of the Red Palette Color Lookup Table Data (0028,1201). Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See Palette Color Lookup Table Descriptor in [] for further explanation.		
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	US/SS 3	Specifies the format of the Green Palette Color Lookup Table Data (0028,1202). Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See Palette Color Lookup Table Descriptor in [] for further explanation.		
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	US/SS 3	Specifies the format of the Blue Palette Color Lookup Table Data (0028,1203). Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See Palette Color Lookup Table Descriptor in [] for further explanation.		
Red Palette Color Lookup Table Data	(0028,1201)	1C	OW 1	Red Palette Color Lookup Table Data. Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED.		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				See Palette Color Lookup Table Data in [] for further explanation.		
Green Palette Color Lookup Table Data	(0028,1202)	1C	OW 1	Green Palette Color Lookup Table Data. Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See Palette Color Lookup Table Data in [] for further explanation.		
Blue Palette Color Lookup Table Data	(0028,1203)	1C	OW 1	Blue Palette Color Lookup Table Data. Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See Palette Color Lookup Table Data in [] for further explanation.		

8.8.12 Patient Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Patient's Name	(0010,0010)	2	PN 1	The patient's full name.		RTT-PT	Modified
Patient ID	(0010,0020)	2	LO 1	Primary hospital identification number or code for the patient.		RTT-PT	Modified
Issuer of Patient ID	(0010,0021)	3	LO 1	Identifier of the Assigning Authority that issued the Patient ID.			
Patient's Birth Date	(0010,0030)	2	DA 1	Birth date of the patient.		RTT-PT	Modified
Patient's Sex	(0010,0040)	2	CS 1	Sex of the named patient. Enumerated Values: M male F female O other		RTT-PT	Modified
Referenced Patient Sequence	(0008,1120)	3	SQ 1	A sequence which provides reference to a Patient SOP Class/Instance pair. Only a single Item shall be permitted in this Sequence.			
>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced Patient Sequence (0008,1120) is sent.			
>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced Patient Sequence (0008,1120) is sent.			
Patient's Birth Time	(0010,0032)	3	TM 1	Birth time of the Patient.			
Other Patient IDs	(0010,1000)	3	LO 1-n	Other identification numbers or codes used to identify the patient.			
Other Patient Names	(0010,1001)	3	PN 1-n	Other names used to identify the patient.			
Ethnic Group	(0010,2160)	3	SH 1	Ethnic group or race of the patient.			
Patient Comments	(0010,4000)	3	LT 1	User-defined additional information about the patient.		RTT-PT	Modified
Patient's Telephone Numbers	(0010,2154)	3	SH 1-n	Telephone numbers at which the patient can be reached	Attribute is taken from the patient demographic module and is not defined in the patient	RTT-PT	Read

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
					module.		

8.8.13 Patient Study Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Admitting Diagnoses Description	(0008,1080)	3	LO 1-n	Description of the admitting diagnosis (diagnoses)			
Admitting Diagnoses Code Sequence	(0008,1084)	3	SQ 1	A sequence that conveys the admitting diagnosis (diagnoses). One or more Items may be included in this Sequence.			
>Include 'Code Sequence Macro' Table 8.8-1					No Baseline Context ID is defined.		
Patient's Age	(0010,1010)	3	AS 1	Age of the Patient.	Study		
Patient's Size	(0010,1020)	3	DS 1	Length or size of the Patient, in meters.	Patient		
Patient's Weight	(0010,1030)	3	DS 1	Weight of the Patient, in kilograms.	Study		
Occupation	(0010,2180)	3	SH 1	Occupation of the Patient.			
Additional Patient's History	(0010,21B0)	3	LT 1	Additional information about the Patient's medical history.			
Admission ID	(0038,0010)	3	LO 1	Identification number of the visit as assigned by the healthcare provider			
Issuer of Admission ID	(0038,0011)	3	LO 1	Name of healthcare provider that issued the Admission ID			
Patient's Sex Neutered	(0010,2203)	2C	CS 1	Whether or not a procedure has been performed in an effort to render the patient sterile. Enumerated value: ALTERED = Altered/Neutered UNALTERED = Unaltered/intact Note: If this Attribute is present but has no value then the status is unknown. Required if patient is an animal. May be present otherwise.			

8.8.14 ROI Contour Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
ROI Contour Sequence	(3006,0039)	1	SQ 1	Introduces sequence of Contour Sequences defining ROIs. One or more items may be included in this sequence.		
>Referenced ROI Number	(3006,0084)	1	IS 1	Uniquely identifies the referenced ROI described in the Structure Set ROI Sequence (3006,0020).		
>ROI Display Color	(3006,002A)	3	IS 3	RGB triplet color representation for ROI, specified using the range 0-255.		
>Contour Sequence	(3006,0040)	3	SQ 1	Introduces sequence of Contours defining ROI. One or more items may be included in this sequence.		
>>Contour Number	(3006,0048)	3	IS 1	Identification number of the contour. The value of Contour Number (3006,0048) shall be unique within the Contour Sequence (3006,0040) in which it is defined. No semantics or ordering shall be inferred from this attribute.		
>>Attached Contours	(3006,0049)	3	IS 1-n	List of Contour Number (3006,0048) defining lower-numbered contour(s) to which the current contour is connected.		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
>>Contour Image Sequence	(3006,0016)	3	SQ 1	Introduces sequence of images containing the contour. One or more items may be included in this sequence.		
>>>Include 'Image SOP Instance Reference Macro'						
>>Contour Geometric Type	(3006,0042)	1C	CS 1	Geometric type of contour. Required if Contour Sequence (3006,0040) is sent. See PS 3.3 C.8.8.6.1. Enumerated Values: POINT = single point OPEN_PLANAR = open contour containing coplanar points OPEN_NONPLANAR = open contour containing non-coplanar points CLOSED_PLANAR = closed contour (polygon) containing coplanar points		
>>Contour Slab Thickness	(3006,0044)	3	DS 1	Thickness of slab (in mm) represented by contour, where the Contour Data (3006,0050) defines a plane in the center of the slab, offset by the Contour Offset Vector (3006,0045) if it is present. See PS 3.3 C.8.8.6.2.		
>>Contour Offset Vector	(3006,0045)	3	DS 3	Vector (x,y,z) in the the patient based coordinate system described in PS 3.3 C.7.6.2.1.1 which is normal to plane of Contour Data (3006,0050), describing direction and magnitude of the offset (in mm) of each point of the central plane of a contour slab from the corresponding original point of Contour Data (3006,0050). See PS 3.3 C.8.8.6.2.		
>>Number of Contour Points	(3006,0046)	1C	IS 1	Number of points (triplets) in Contour Data (3006,0050). Required if Contour Sequence (3006,0040) is sent.		
>>Contour Data	(3006,0050)	1C	DS 3-3n	Sequence of (x,y,z) triplets defining a contour in the patient based coordinate system described in PS 3.3 C.7.6.2.1.1 (mm). Required if Contour Sequence (3006,0040) is sent. See PS 3.3 C.8.8.6.1 and PS 3.3 C.8.8.6.3. Note: Contour Data may not be properly encoded if Explicit-VR transfer syntax is used and the VL of this attribute exceeds 65534 bytes.		

8.8.15 RT Beams Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
Private Extensions for this module can be found in "RT General Plan::External Attributes"								
Beam Sequence	(300A,00B0)	1	SQ 1	Introduces sequence of treatment beams for current RT Plan. One or more items may be included in this sequence.				
>Beam Number	(300A,00C0)	1	IS 1	Identification number of the Beam. The value of Beam Number (300A,00C0) shall be unique within the RT Plan in which it is created. See Note 1.				
>Beam Name	(300A,00C2)	3	LO 1	User-defined name for Beam. See Note 1.				
>Beam Description	(300A,00C3)	3	ST 1	User-defined description for Beam. See Note 1.				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
>Beam Type	(300A,00C4)	1	CS 1	Motion characteristic of Beam. See Note 5. Enumerated Values: STATIC = All Control Point Sequence (300A,0111) attributes remain unchanged between consecutive pairs of control points with changing Cumulative Meterset Weight (300A,0134). DYNAMIC = One or more Control Point Sequence (300A,0111) attributes change between one or more consecutive pairs of control points with changing Cumulative Meterset Weight (300A,0134).				
>Referenced Beam Number	(300C,0006)	3	IS 1	Uniquely identifies the corresponding treatment beam specified by Beam Number (300A,00C0) within Beam Sequence in RT (Ion) Beams Module within the RT (Ion) Plan referenced in Referenced RT Plan Sequence (300C,0002).				
>Radiation Type	(300A,00C6)	2	CS 1	Particle type of Beam. Defined Terms: PHOTON ELECTRON NEUTRON PROTON				
>High-Dose Technique Type	(300A,00C7)	1C	CS 1	Type of high-dose treatment technique. Defined Terms: NORMAL = Standard treatment TBI = Total Body Irradiation HDR = High Dose Rate Required if treatment technique requires a dose that would normally require overriding of treatment machine safety controls.				
>Treatment Machine Name	(300A,00B2)	2	SH 1	User-defined name identifying treatment machine to be used for beam delivery. See Note 2.				
>Manufacturer	(0008,0070)	3	LO 1	Manufacturer of the equipment to be used for beam delivery.				
>Institution Name	(0008,0080)	3	LO 1	Institution where the equipment is located that is to be used for beam delivery.				
>Institution Address	(0008,0081)	3	ST 1	Mailing address of the institution where the equipment is located that is to be used for				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				beam delivery.				
>Institutional Department Name	(0008,1040)	3	LO 1	Department in the institution where the equipment is located that is to be used for beam delivery.				
>Manufacturer's Model Name	(0008,1090)	3	LO 1	Manufacturer's model name of the equipment that is to be used for beam delivery.				
>Device Serial Number	(0018,1000)	3	LO 1	Manufacturer's serial number of the equipment that is to be used for beam delivery.				
>Primary Dosimeter Unit	(300A,00B3)	3	CS 1	Measurement unit of machine dosimeter. See PS 3.3 C.8.8.14.1. Enumerated Values: MU = Monitor Unit MINUTE = minute				
>Referenced Tolerance Table Number	(300C,00A0)	3	IS 1	Uniquely identifies Tolerance Table specified by Tolerance Table Number (300A,0042) within Tolerance Table Sequence in RT Tolerance Tables Module. These tolerances are to be used for verification of treatment machine settings.				
>Source-Axis Distance	(300A,00B4)	3	DS 1	Radiation source to Gantry rotation axis distance of the equipment that is to be used for beam delivery (mm).				
>Beam Limiting Device Sequence	(300A,00B6)	1	SQ 1	Introduces sequence of beam limiting device (collimator) jaw or leaf (element) sets. One or more items may be included in this sequence.				
>>RT Beam Limiting Device Type	(300A,00B8)	1	CS 1	Type of beam limiting device (collimator). Enumerated Values: X = symmetric jaw pair in IEC X direction Y = symmetric jaw pair in IEC Y direction ASYMX = asymmetric jaw pair in IEC X direction ASYMY = asymmetric pair in IEC Y direction MLCX = multileaf (multi-element) jaw pair in IEC X direction MLCY = multileaf (multi-element) jaw pair in IEC Y direction				
>>Source to Beam Limiting Device Distance	(300A,00BA)	3	DS 1	Radiation source to beam limiting device (collimator) distance of the equipment that is to be used for beam				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				delivery (mm).				
>>Number of Leaf/Jaw Pairs	(300A,00BC)	1	IS 1	Number of leaf (element) or jaw pairs (equal to 1 for standard beam limiting device jaws).				
>>Leaf Position Boundaries	(300A,00BE)	2C	DS 3-n	Boundaries of beam limiting device (collimator) leaves (in mm) in IEC BEAM LIMITING DEVICE coordinate axis appropriate to RT Beam Limiting Device Type (300A,00B8), i.e. X-axis for MLCY, Y-axis for MLCX. Contains N+1 values, where N is the Number of Leaf/Jaw Pairs (300A,00BC), starting from Leaf (Element) Pair 1. Required if Beam Limiting Device Sequence (300A,00B6) is sent and RT Beam Limiting Device Type (300A,00B8) is MLCX or MLCY. See Note 3.				
>Referenced Patient Setup Number	(300C,006A)	3	IS 1	Uniquely identifies Patient Setup to be used for current beam, specified by Patient Setup Number (300A,0182) within Patient Setup Sequence of RT Patient Setup Module.				
>Referenced Reference Image Sequence	(300C,0042)	3	SQ 1	Introduces sequence of reference images used for validation of current beam. One or more items may be included in this sequence.				
>>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced Reference Image Sequence (300C,0042) is sent.				
>>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced Reference Image Sequence (300C,0042) is sent.				
>>Reference Image Number	(300A,00C8)	1C	IS 1	Uniquely identifies Reference Image within Referenced Reference Image Sequence (300C,0042). Required if Referenced Reference Image Sequence (300C,0042) is sent.				
>>Start Cumulative	(300C,0008)	3	DS 1	Cumulative Meterset Weight within current				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
Meterset Weight				Beam at which image acquisition starts.				
>>End Cumulative Meterset Weight	(300C,0009)	3	DS 1	Cumulative Meterset Weight within current Beam at which image acquisition ends.				
>Planned Verification Image Sequence	(300A,00CA)	3	SQ 1	Introduces sequence of planned verification images to be acquired during current beam. One or more items may be included in this sequence. See PS 3.3 C.8.8.14.2.				
>>Start Cumulative Meterset Weight	(300C,0008)	3	DS 1	Cumulative Meterset Weight within current Beam at which image acquisition will start.				
>>Meterset Exposure	(3002,0032)	3	DS 1	Meterset duration over which image is to be acquired, specified in Monitor units (MU) or minutes as defined by Primary Dosimeter Unit (300A,00B3).				
>>End Cumulative Meterset Weight	(300C,0009)	3	DS 1	Cumulative Meterset Weight within current Beam at which image acquisition will end.				
>>RT Image Plane	(3002,000C)	3	CS 1	Describes whether or not image plane is normal to beam axis. Enumerated Values: NORMAL = image plane normal to beam axis NON_NORMAL = image plane non-normal to beam axis				
>>X-Ray Image Receptor Angle	(3002,000E)	3	DS 1	X-Ray Image Receptor Angle i.e. orientation of IEC X-RAY IMAGE RECEPTOR coordinate system with respect to IEC GANTRY coordinate system (degrees). See PS 3.3 C.8.8.14.3.				
>>RT Image Orientation	(3002,0010)	3	DS 6	The direction cosines of the first row and the first column with respect to the IEC X-RAY IMAGE RECEPTOR coordinate system.				
>>RT Image Position	(3002,0012)	3	DS 2	The x and y coordinates (in mm) of the upper left hand corner of the image, in the IEC X-RAY IMAGE RECEPTOR coordinate system. This is the center of the first pixel transmitted.				
>>RT Image SID	(3002,0026)	3	DS 1	Radiation machine source to image plane distance (mm).				
>>Imaging	(300A,00CC	3	LO 1-	User-specified device-				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
Device-Specific Acquisition Parameters	)		n	specific parameters that describe how the imager will acquire the image.				
>>Referenced Reference Image Number	(300C,0007)	3	IS 1	Uniquely identifies Reference Image to which planned verification image is related, specified by Reference Image Number (300A,00C8) within Referenced Reference Image Sequence (300C,0042).				
>Treatment Delivery Type	(300A,00CE)	3	CS 1	Delivery Type of treatment. Defined Terms: TREATMENT = normal patient treatment OPEN_PORTFILM = portal image acquisition with open field TRMT_PORTFILM = portal image acquisition with treatment port CONTINUATION = continuation of interrupted treatment SETUP no treatment beam is applied for this RT Beam. To be used for specifying the gantry, couch, and other machine positions where X-ray set-up images or measurements shall be taken.	Note that in "RT Ion Beams::Treatment Delivery Type", a private extension XA_Imaging exists. As of writing this comment (2008-04-17), TxSessionData.NET returns the same enum for both RT Beam and RT Ion Beam for sake of simplicity of the implementation. The private extension XA_Imaging should not be used inside RT Beams. In contrast, RT Ion Beams should be extended to allow for the same Imaging@Treatment modelling facilities as RT Beam does.			
>Referenced Dose Sequence	(300C,0080)	3	SQ 1	Introduces sequence of related SOP Class/Instance pairs describing related instances of RT Dose (for grids, isodose curves, and named/unnamed point doses). One or more items may be included in this sequence.				
>>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced Dose Sequence (300C,0080) is sent.				
>>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced Dose Sequence (300C,0080) is sent.				
>Number of Wedges	(300A,00D0)	1	IS 1	Number of wedges associated with current Beam.				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
>Wedge Sequence	(300A,00D1)	1C	SQ 1	Introduces sequence of treatment wedges. Required if Number of Wedges (300A,00D0) is non-zero. One or more items may be included in this sequence.				
>>Wedge Number	(300A,00D2)	1C	IS 1	Identification number of the Wedge. The value of Wedge Number (300A,00D2) shall be unique within the Beam in which it is created. Required if Wedge Sequence (300A,00D1) is sent.				
>>Wedge Type	(300A,00D3)	2C	CS 1	Type of wedge (if any) defined for Beam. Required if Wedge Sequence (300A,00D1) is sent. Defined Terms: STANDARD = standard (static) wedge DYNAMIC = moving beam limiting device (collimator) jaw simulating wedge MOTORIZED = single wedge which can be removed from beam remotely				
>>Wedge ID	(300A,00D4)	3	SH 1	User-supplied identifier for Wedge.				
>>Accessory Code	(300A,00F9)	3	LO 1	An identifier for the accessory intended to be read by a device such as a bar-code reader.				
>>Wedge Angle	(300A,00D5)	2C	IS 1	Nominal wedge angle (degrees). Required if Wedge Sequence (300A,00D1) is sent.				
>>Wedge Factor	(300A,00D6)	2C	DS 1	Nominal wedge factor under machine calibration conditions at the beam energy specified by the Nominal Beam Energy (300A,0114) of the first Control Point of the Control Point Sequence (300A,0111). Required if Wedge Sequence (300A,00D1) is sent.				
>>Wedge Orientation	(300A,00D8)	2C	DS 1	Orientation of wedge, i.e. orientation of IEC WEDGE FILTER coordinate system with respect to IEC BEAM LIMITING DEVICE coordinate system (degrees). Required if Wedge Sequence (300A,00D1) is sent.				
>>Source to Wedge Tray Distance	(300A,00DA)	3	DS 1	Radiation source to wedge tray attachment edge distance (in mm)				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				for current wedge.				
>Number of Compensators	(300A,00E0)	1	IS 1	Number of compensators associated with current Beam.				
>Total Compensator Tray Factor	(300A,00E2)	3	DS 1	Compensator Tray transmission factor (between 0 and 1), at the beam energy specified by the Nominal Beam Energy (300A,0114) of the first Control Point of the Control Point Sequence (300A,0111).				
>Compensator Sequence	(300A,00E3)	1C	SQ 1	Introduces sequence of treatment compensators. Required if Number of Compensators (300A,00E0) is non-zero. One or more items may be included in this sequence.				
>>Compensator Number	(300A,00E4)	1C	IS 1	Identification number of the Compensator. The value of Compensator Number (300A,00E4) shall be unique within the Beam in which it is created. Required if Number of Compensators (300A,00E0) is non-zero.				
>>Compensator Type	(3004,00EE)	3	CS 1	Type of compensator (if any). Defined Terms: STANDARD = physical (static) compensator DYNAMIC = moving Beam Limiting Device (collimator) simulating physical compensator				
>>Material ID	(300A,00E1)	2C	SH 1	User-supplied identifier for material used to manufacture Compensator. Required if Number of Compensators (300A,00E0) is non-zero.				
>>Compensator ID	(300A,00E5)	3	SH 1	User-supplied identifier for compensator.				
>>Accessory Code	(300A,00F9)	3	LO 1	An identifier for the accessory intended to be read by a device such as a bar-code reader.				
>>Source to Compensator Tray Distance	(300A,00E6)	2C	DS 1	Radiation source to compensator tray attachment edge distance (in mm) for current compensator. Required if Compensator Sequence				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				(300A,00E3) is sent.				
>>Compensator Divergence	(300A,02E0)	3	CS 1	Indicates presence or absence of geometrical divergence of the compensator. Enumerated Values: PRESENT = the compensator is shaped according to the beam geometrical divergence. ABSENT = the compensator is not shaped according to the beam geometrical divergence.				
>>Compensator Mounting Position	(300A,02E1)	3	CS 1	Indicates on which side of the Compensator Tray the compensator is mounted. Enumerated Values: PATIENT_SIDE = the compensator is mounted on the side of the Compensator Tray which is towards the patient. SOURCE_SIDE = the compensator is mounted on the side of the Compensator Tray which is towards the radiation source. DOUBLE_SIDED = the compensator has a shaped (i.e. non-flat) surface on both sides of the Compensator Tray.				
>>Compensator Rows	(300A,00E7)	1C	IS 1	Number of rows in the compensator. Required if Compensator Sequence (300A,00E3) is sent.				
>>Compensator Columns	(300A,00E8)	1C	IS 1	Number of columns in the compensator. Required if Compensator Sequence (300A,00E3) is sent.				
>>Compensator Pixel Spacing	(300A,00E9)	1C	DS 2	Physical distance (in mm) between the center of each pixel projected onto machine isocentric plane. Specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing. Required if Compensator Sequence (300A,00E3) is sent.				
>>Compensator Position	(300A,00EA)	1C	DS 2	The x and y coordinates of the upper left hand corner (first pixel transmitted) of the				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				compensator, projected onto the machine isocentric plane in the IEC BEAM LIMITING DEVICE coordinate system (mm). Required if Compensator Sequence (300A,00E3) is sent.				
>>Compensator Transmission Data	(300A,00EB)	1C	DS 1-n	A data stream of the pixel samples which comprise the compensator, expressed as broad-beam transmission values (between 0 and 1) along a ray line passing through the pixel, at the beam energy specified by the Nominal Beam Energy (300A,0114) of the first Control Point of the Control Point Sequence (300A,0111). The order of pixels sent is left to right, top to bottom, i.e., the upper left pixel is sent first followed by the remainder of the first row , followed by the first pixel of the 2nd row, then the remainder of the 2nd row and so on) when viewed from the radiation source. Required if Compensator Sequence (300A,00E3) is sent and Material ID (300A,00E1) is zero-length. See PS 3.3 C.8.8.14.10. Note: Compensator Transmission Data may not be properly encoded if Explicit-VR transfer syntax is used and the VL of this attribute exceeds 65534 bytes.				
>>Compensator Thickness Data	(300A,00EC)	1C	DS 1-n	A data stream of the pixel samples which comprise the compensator, expressed as thicknesses (in mm). The order of pixels sent is left to right, top to bottom, i.e., the upper left pixel is sent first followed by the remainder of the first row , followed by the first pixel of the 2nd row, then the remainder of the 2nd				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				row and so on) when viewed from the radiation source. Required if Compensator Sequence (300A,00E3) is sent and Material ID (300A,00E1) is non-zero length. See PS 3.3 C.8.8.14.9 and PS 3.3 C.8.8.14.10. Note: Compensator Thickness Data may not be properly encoded if Explicit-VR transfer syntax is used and the VL of this attribute exceeds 65534 bytes.				
>>Source to Compensator Distance	(300A,02E2)	1C	DS 1	A data stream of the pixel samples which comprise the distance from the radiation source to the compensator surface closest to the radiation source (in mm). The order of pixels sent is left to right, top to bottom (upper left pixel, followed by the remainder of row 1, followed by the remainder of the columns). Required if Compensator Sequence (300A,00E3) is sent, Material ID (300A,00E1) is non-zero length, and Compensator Mounting Position (300A,02E1) is DOUBLE_SIDED. See PS 3.3 C.8.8.14.9.				
>Number of Boli	(300A,00ED)	1	IS 1	Number of boli associated with current Beam.				
>Referenced Bolus Sequence	(300C,00B0)	1C	SQ 1	Introduces sequence of boli associated with Beam. Required if Number of Boli (300A,00ED) is non-zero. One or more items may be included in this sequence.				
>>Referenced ROI Number	(3006,0084)	1C	IS 1	Uniquely identifies ROI representing the Bolus specified by ROI Number (3006,0022) in Structure Set ROI Sequence (3006,0020) in Structure Set Module within RT Structure Set in Referenced Structure Set Sequence (300C,0060) in RT General Plan Module.				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				Required if Referenced Bolus Sequence (300C,00B0) is sent.				
>>Bolus ID	(300A,00DC)	3	SH 1	User-supplied identifier for the Bolus.				
>>Bolus Description	(300A,00DD)	3	ST 1	User-defined description for the Bolus.				
>>Accessory Code	(300A,00F9)	3	LO 1	An identifier for the accessory intended to be read by a device such as a bar-code reader.				
>Number of Blocks	(300A,00F0)	1	IS 1	Number of shielding blocks associated with Beam.				
>Total Block Tray Factor	(300A,00F2)	3	DS 1	Total block tray transmission for all block trays (between 0 and 1) at the beam energy specified by the Nominal Beam Energy (300A,0114) of the first Control Point of the Control Point Sequence (300A,0111).				
>Block Sequence	(300A,00F4)	1C	SQ 1	Introduces sequence of blocks associated with Beam. Required if Number of Blocks (300A,00F0) is non-zero. One or more items may be included in this sequence.				
>>Block Tray ID	(300A,00F5)	3	SH 1	User-supplied identifier for block tray.				
>>Accessory Code	(300A,00F9)	3	LO 1	An identifier for the accessory intended to be read by a device such as a bar-code reader.				
>>Source to Block Tray Distance	(300A,00F6)	2C	DS 1	Radiation Source to attachment edge of block tray assembly (mm). Required if Block Sequence (300A,00F4) is sent.				
>>Block Type	(300A,00F8)	1C	CS 1	Type of block. Required if Block Sequence (300A,00F4) is sent. See PS 3.3 C.8.8.14.4. Enumerated Values: SHIELDING = blocking material is inside contour APERTURE = blocking material is outside contour				
>>Block Divergence	(300A,00FA)	2C	CS 1	Indicates presence or otherwise of geometrical divergence. Required if Block Sequence (300A,00F4) is sent. Enumerated Values: PRESENT = block				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				edges are shaped for beam divergence ABSENT = block edges are not shaped for beam divergence				
>>Block Mounting Position	(300A,00FB)	3	CS 1	Indicates on which side of the Block Tray the block is mounted. Enumerated Values: PATIENT_SIDE = the block is mounted on the side of the Block Tray which is towards the patient. SOURCE_SIDE = the block is mounted on the side of the Block Tray which is towards the radiation source.				
>>Block Number	(300A,00FC)	1C	IS 1	Identification number of the Block. The value of Block Number (300A,00FC) shall be unique within the Beam in which it is created. Required if Block Sequence (300A,00F4) is sent.				
>>Block Name	(300A,00FE)	3	LO 1	User-defined name for block.				
>>Material ID	(300A,00E1)	2C	SH 1	User-supplied identifier for material used to manufacture Block. Required if Block Sequence (300A,00F4) is sent.				
>>Block Thickness	(300A,0100)	2C	DS 1	Physical thickness of block (in mm) parallel to radiation beam axis. Required if Block Sequence (300A,00F4) is sent and Material ID (300A,00E1) is non-zero length. See PS 3.3 C.8.8.14.4.				
>>Block Transmission	(300A,0102)	2C	DS 1	Transmission through the block (between 0 and 1) at the beam energy specified by the Nominal Beam Energy (300A,0114) of the first Control Point of the Control Point Sequence (300A,0111). Required if Block Sequence (300A,00F4) is sent and Material ID (300A,00E1) is zero length. See PS 3.3 C.8.8.14.4.				
>>Block Number of Points	(300A,0104)	2C	IS 1	Number of (x,y) pairs defining the block edge. Required if Block Sequence (300A,00F4) is sent.				
>>Block Data	(300A,0106)	2C	DS 2-2n	A data stream of (x,y) pairs which comprise the block edge. The				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				number of pairs shall be equal to Block Number of Points (300A,0104), and the vertices shall be interpreted as a closed polygon. Coordinates are projected onto the machine isocentric plane in the IEC BEAM LIMITING DEVICE coordinate system (mm). Required if Block Sequence (300A,00F4) is sent. See Note 4.				
>Applicator Sequence	(300A,0107)	3	SQ 1	Introduces sequence of Applicators associated with Beam. Only a single item shall be permitted in this sequence.				
>>Applicator ID	(300A,0108)	1C	SH 1	User or machine supplied identifier for Applicator. Required if Applicator Sequence (300A,0107) is sent.				
>>Accessory Code	(300A,00F9)	3	LO 1	An identifier for the accessory intended to be read by a device such as a bar-code reader.				
>>Applicator Type	(300A,0109)	1C	CS 1	Type of Applicator. Required if Applicator Sequence (300A,0107) is sent. Defined Terms: ELECTRON_SQUARE = square electron applicator ELECTRON_RECT = rectangular electron applicator ELECTRON_CIRC = circular electron applicator ELECTRON_SHORT = short electron applicator ELECTRON_OPEN = open (dummy) electron applicator INTRAOPERATIVE = intraoperative (custom) applicator STEREOTACTIC = stereotactic applicator				
>>Applicator Description	(300A,010A)	3	LO 1	User-defined description for Applicator.				
>Number of Therapy Detectors	(300B,xxA3)	3	IS 1	Number of Therapy Detectors associated with current beam.	Introduced this sequence in analogy to RT Ion Beams.		RTT-PT	Read
>Therapy Detector Sequence	(300B,xxA4)	3	SQ 1	Introduces sequence of Therapy Detectors associated with Beam. Required if Number of Therapy Detectors (300B,xxA3) is non-zero. The number of			RTT-PT	Read

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				items shall be identical to the value of Number of Therapy Detectors (300B,xxA3).				
>>Therapy Detector Number	(300B,xxA5)	1	IS 1	Identification number of the Therapy Detector. The value of Therapy Detector Number (300B,xxA5) shall be unique within the Beam in which it is created.			RTT-PT	Read
>>Therapy Detector Setup ID	(300B,xxA6)	1	SH 1	User or machine supplied identifier for setup containing Therapy Detector.	This is the ID of the corresponding TherapyDetectorIn Phantom instance in Admin&Config		RTT-PT	Read
>Final Cumulative Meterset Weight	(300A,010E)	1C	DS 1	Value of Cumulative Meterset Weight (300A,0134) for final Control Point in Control Point Sequence (300A,0111). Required if Cumulative Meterset Weight is non-null in Control Points specified within Control Point Sequence (300A,0111). See PS 3.3 C.8.8.14.1.				
>Number of Control Points	(300A,0110)	1	IS 1	Number of control points in Beam.				
>Control Point Sequence	(300A,0111)	1	SQ 1	Introduces sequence of machine configurations describing treatment beam. Two or more items may be included in this sequence. See PS 3.3 C.8.8.14.5 and PS 3.3 C.8.8.14.6.				
>>Control Point Index	(300A,0112)	1C	IS 1	Index of current Control Point, starting at 0 for first Control Point. Required if Control Point Sequence (300A,0111) is sent.				
>>Cumulative Meterset Weight	(300A,0134)	2C	DS 1	Cumulative weight to current control point. Cumulative Meterset Weight for the first item in Control Point Sequence shall always be zero. Cumulative Meterset Weight for the final item in Control Point Sequence shall always be equal to Final Cumulative Meterset Weight. Required if Control Point Sequence (300A,0111) is sent. See PS 3.3 C.8.8.14.1.				
>>Referenced Dose Reference	(300C,0050)	3	SQ 1	Introduces a sequence of Dose References				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
Sequence				for current Beam. One or more items may be included in this sequence.				
>>>Referenced Dose Reference Number	(300C,0051)	1C	IS 1	Uniquely identifies Dose Reference specified by Dose Reference Number (300A,0012) in Dose Reference Sequence (300A,0010) in RT Prescription Module. Required if Referenced Dose Reference Sequence (300C,0050) is sent.				
>>>Cumulative Dose Reference Coefficient	(300A,010C)	2C	DS 1	Coefficient used to calculate cumulative dose contribution from this Beam to the referenced Dose Reference at the current Control Point. Required if Referenced Dose Reference Sequence (300C,0050) is sent. See PS 3.3 C.8.8.14.7.				
>>Referenced Dose Sequence	(300C,0080)	1C	SQ 1	Sequence describing related instances of RT Dose (for grids, isodose curves, and named/unnamed point doses). One or more items may be included in this sequence. Required if RT Dose is being sent, and Dose Summation Type (3004,000A) equals CONTROL_POINT.				
>>>Referenced SOP Class UID	(0008,1150)	1	UI 1	Uniquely identifies the referenced SOP Class.				
>>>Referenced SOP Instance UID	(0008,1155)	1	UI 1	Uniquely identifies the referenced SOP Instance.				
>>Nominal Beam Energy	(300A,0114)	3	DS 1	Nominal Beam Energy at control point (MV/MeV).				
>>Dose Rate Set	(300A,0115)	3	DS 1	Dose Rate to be set on treatment machine for segment beginning at current control point (e.g. MU/min).				
>>Wedge Position Sequence	(300A,0116)	3	SQ 1	A Sequence of Items describing Wedge Positions for the current control point. Required for first item of Control Point Sequence if Number of Wedges (300A,00D0) is non-zero, and in subsequent control points if Wedge Position (300A,0118) changes during Beam. See PS 3.3 C.8.8.14.5. The number of items in				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				this sequence shall equal the value of Number of Wedges (300A,00D0).				
>>>Referenced Wedge Number	(300C,00C0)	1C	IS 1	Uniquely references Wedge described by Wedge Number (300A,00D2) in Wedge Sequence (300A,00D1). Required if Wedge Position Sequence (300A,0116) is sent.				
>>>Wedge Position	(300A,0118)	1C	CS 1	Position of Wedge at current Control Point. Required if Wedge Position Sequence (300A,0116) is sent. Enumerated Values: IN OUT				
>>Beam Limiting Device Position Sequence	(300A,011A)	1C	SQ 1	Introduces sequence of beam limiting device (collimator) jaw or leaf (element) positions. Required for first item of Control Point Sequence, or if Beam Limiting Device changes during Beam. One or more items may be included in this sequence.				
>>>RT Beam Limiting Device Type	(300A,00B8)	1C	CS 1	Type of beam limiting device (collimator). The value of this attribute shall correspond to RT Beam Limiting Device Type (300A,00B8) defined in an item of Beam Limiting Device Sequence (300A,00B6). Required if Beam Limiting Device Position Sequence (300A,011A) is sent. Enumerated Values: X = symmetric jaw pair in IEC X direction Y = symmetric jaw pair in IEC Y direction ASYMX = asymmetric jaw pair in IEC X direction ASYMY = asymmetric pair in IEC Y direction MLCX = multileaf (multi-element) jaw pair in IEC X direction MLCY = multileaf (multi-element) jaw pair in IEC Y direction				
>>>Leaf/Jaw Positions	(300A,011C)	1C	DS 2-2n	Positions of beam limiting device (collimator) leaf (element) or jaw pairs (in mm) in IEC BEAM LIMITING DEVICE coordinate axis				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				appropriate to RT Beam Limiting Device Type (300A,00B8), e.g. X-axis for MLCX, Y-axis for MLCY. Contains 2N values, where N is the Number of Leaf/Jaw Pairs (300A,00BC) in Beam Limiting Device Sequence (300A,00B6). Values shall be listed in IEC leaf (element) subscript order 101, 102, ... 1N, 201, 202, ... 2N. Required if Beam Limiting Device Position Sequence (300A,011A) is sent. See Note 2.				
>>Therapy Detector Settings Sequence	(300B,xxA7)	3	SQ 1	Introduces sequence of Therapy Detector settings for the current control point. One or more items may be included in this sequence. Required for first item of Control Point Sequence if Number of Therapy Detectors (300B, ..) is non-zero, or if Therapy Detector Setting (300B, ..) changes during Beam.	Introduced this sequence in analogy to RT Ion Beams.		RTT-PT	Read
>>>Referenced Therapy Detector Number	(300B,xxA8)	1	IS 1	Uniquely references Therapy Detector described by Therapy Detector Number (300B,xxA5) in Therapy Detector Sequence (300B,xxA4).			RTT-PT	Read
>>>Therapy Detector Position	(300B,xxA9)	1	DS 3	Therapy Detector coordinates (x,y,z) in the patient based coordinate system described in PS 3.3 C.7.6.2.1.1 (mm).			RTT-PT	Read
>>Gantry Angle	(300A,011E)	1C	DS 1	Gantry angle of radiation source, i.e. orientation of IEC GANTRY coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees). Required for first item of Control Point Sequence, or if Gantry Angle changes during Beam.				
>>Gantry Rotation Direction	(300A,011F)	1C	CS 1	Direction of Gantry Rotation when viewing gantry from isocenter, for segment following Control Point. Required for first item of Control Point Sequence, or if Gantry Rotation Direction				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				changes during Beam. See PS 3.3 C.8.8.14.8. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation				
>>Beam Limiting Device Angle	(300A,0120)	1C	DS 1	Beam Limiting Device angle, i.e. orientation of IEC BEAM LIMITING DEVICE coordinate system with respect to IEC GANTRY coordinate system (degrees). Required for first item of Control Point Sequence, or if Beam Limiting Device Angle changes during Beam.				
>>Beam Limiting Device Rotation Direction	(300A,0121)	1C	CS 1	Direction of Beam Limiting Device Rotation when viewing beam limiting device (collimator) from radiation source, for segment following Control Point. Required for first item of Control Point Sequence, or if Beam Limiting Device Rotation Direction changes during Beam. See PS 3.3 C.8.8.14.8. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation				
>>Patient Support Angle	(300A,0122)	1C	DS 1	Patient Support angle, i.e. orientation of IEC PATIENT SUPPORT (turntable) coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees). Required for first item of Control Point Sequence, or if Patient Support Angle changes during Beam.				
>>Patient Support Rotation Direction	(300A,0123)	1C	CS 1	Direction of Patient Support Rotation when viewing table from above, for segment following Control Point. Required for first item of Control Point Sequence, or if Patient Support Rotation Direction changes during Beam. See PS 3.3 C.8.8.14.8. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation				
>>Table Top Eccentric Axis	(300A,0124)	3	DS 1	Distance (positive) from the IEC PATIENT				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
Distance				SUPPORT vertical axis to the IEC TABLE TOP ECCENTRIC vertical axis (mm).				
>>Table Top Eccentric Angle	(300A,0125)	1C	DS 1	Table Top (non-isocentric) angle, i.e. orientation of IEC TABLE TOP ECCENTRIC coordinate system with respect to IEC PATIENT SUPPORT coordinate system (degrees). Required for first item of Control Point Sequence, or if Table Top Eccentric Angle changes during Beam.				
>>Table Top Eccentric Rotation Direction	(300A,0126)	1C	CS 1	Direction of Table Top Eccentric Rotation when viewing table from above, for segment following Control Point. Required for first item of Control Point Sequence, or if Table Top Eccentric Rotation Direction changes during Beam. See PS 3.3 C.8.8.14.8. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation				
>>Table Top Vertical Position	(300A,0128)	2C	DS 1	Table Top Vertical position in IEC TABLE TOP coordinate system (mm). Required for first item of Control Point Sequence, or if Table Top Vertical Position changes during Beam. See PS 3.3 C.8.8.14.6.				
>>Table Top Longitudinal Position	(300A,0129)	2C	DS 1	Table Top Longitudinal position in IEC TABLE TOP coordinate system (mm). Required for first item of Control Point Sequence, or if Table Top Longitudinal Position changes during Beam. See PS 3.3 C.8.8.14.6.				
>>Table Top Lateral Position	(300A,012A)	2C	DS 1	Table Top Lateral position in IEC TABLE TOP coordinate system (mm). Required for first item of Control Point Sequence, or if Table Top Lateral Position changes during Beam. See PS 3.3 C.8.8.14.6.				
>>Isocenter Position	(300A,012C)	2C	DS 3	Isocenter coordinates (x,y,z) in the patient based coordinate				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				system described in PS 3.3 C.7.6.2.1.1 (mm). Required for first item of Segment Control Point Sequence, or if Segment Isocenter Position changes during Beam.				
>>Surface Entry Point	(300A,012E)	3	DS 1	Patient surface entry point coordinates (x,y,z) in the patient based coordinate system described in PS 3.3 C.7.6.2.1.1 (mm).				
>>Source to Surface Distance	(300A,0130)	3	DS 1	Source to Patient Surface distance (mm).				
> Referenced Target ROI Sequence	(300B,xx80)	3	SQ 1	Introduces a sequence of target ROIs associated with this beam. Required, if the beam only references a subset of ROIs in Structure Set Module. This tag is required (i.e. implicitly type '1') within TPS.	A beam may be restricted to a subset of target (!) ROIs. There are some limitations with respect to the applicable optimization algorithm, though! If no such SQ exists in the plan, it is assumed that all tagrets are assigned to this beam. In such a case, all expansion margins are taken to be 0.	Refers to the PTV		
>> Referenced ROI Number	(3006,0084)	1	IS 1	Uniquely identifies the ROIs representing targets for this beam, specified by ROI number in Structure Set ROI Sequence in Structure Set Module within RT Structure Set in Referenced Structure Set Sequence in RT General Plan Module.				
>> Target ROI lateral expansion margin	(300B,xx82)	3	DS 1	Specifies the lateral extension of the target in mm within which beamspots may be placed. This value overrides a possible value stored in Target lateral expansion margin in sequence Target expansion sequence.	Introduced to have the possibility to have individual expansion margins for each target of a beam.	0		
>> Target ROI distal expansion margin	(300B,xx83)	3	DS 1	Specifies the extension of the distal boundary of the target volume in mm within which beamspots may still be placed. This value overrides a possible value stored in Target lateral expansion margin in sequence Target		0		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Task	Task Usage
				expansion sequence.				
>> Target ROI proximal expansion margin	(300B,xx84)	3	DS 1	Specifies the extension of the proximal boundary of the target volume in mm within which beamspots may still be placed. This value overrides a possible value stored in Target lateral expansion margin in sequence Target expansion sequence.		0		
> Display Color	(300B,xx9C)	3	IS 3	Display color of the beam stored as 3 RGB values in the range of 0..255.				
> Beam Group Name	(300B,xx9D)	3	SH 1	Name of the beam group this beam belongs to. Beams are grouped having common isocenter.				

8.8.16 RT Beams Session Record

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Operators' Name	(0008,1070)	2	PN 1-n	Name of operator administering treatment session.		
Referenced Fraction Group Number	(300C,0022)	3	IS 1	Identifier of Fraction Group within referenced RT Plan.		
Number of Fractions Planned	(300A,0078)	2	IS 1	Total number of treatments (Fractions) planned for current Fraction Group.		
Primary Dosimeter Unit	(300A,00B3)	1	CS 1	Measurement unit of machine dosimeter. Enumerated Values: MU = Monitor Unit MINUTE = minute		
Treatment Session Beam Sequence	(3008,0020)	1	SQ 1	Introduces sequence of Beams administered during treatment session. The sequence may contain one or more items.		
>Referenced Beam Number	(300C,0006)	3	IS 1	References Beam specified by Beam Number (300A,00C0) in Beam Sequence (300A,00B0) in RT Beams Module within referenced RT Plan.		
>Beam Name	(300A,00C2)	3	LO 1	User-defined name for delivered Beam.		
>Beam Description	(300A,00C3)	3	ST 1	User-defined description for delivered Beam.		
>Beam Type	(300A,00C4)	1	CS 1	Motion characteristic of delivered Beam. Enumerated Values: STATIC = all beam parameters remain unchanged during delivery DYNAMIC = one or more beam parameters changes during delivery		
>Radiation Type	(300A,00C6)	1	CS 1	Particle type of delivered Beam. Defined Terms: PHOTON ELECTRON NEUTRON PROTON.		
>High-Dose Technique Type	(300A,00C7)	1C	CS 1	Type of high-dose treatment technique. Defined Terms: NORMAL = Standard treatment TBI = Total Body Irradiation HDR = High Dose Rate Required if treatment technique requires a dose that		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				would normally require overriding of treatment machine safety controls.		
>Referenced Verification Image Sequence	(300C,0040)	3	SQ 1	Introduces sequence of verification images obtained during delivery of current beam. The sequence may contain one or more items.		
>>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced Verification Image Sequence (300C,0040) is sent.		
>>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced Verification Image Sequence (300C,0040) is sent.		
>>Start Meterset	(3008,0078)	3	DS 1	Cumulative Meterset Weight within Beam referenced by Referenced Beam Number at which image acquisition starts.		
>>End Meterset	(3008,007A)	3	DS 1	Cumulative Meterset Weight within Beam referenced by Referenced Beam Number at which image acquisition ends.		
>Referenced Measured Dose Reference Sequence	(3008,0080)	3	SQ 1	Introduces sequence of doses measured during treatment delivery for current Beam. The sequence may contain one or more items.		
>>Referenced Dose Reference Number	(300C,0051)	1C	IS 1	Uniquely references Dose Reference specified by Dose Reference Number (300A,0012) in Dose Reference Sequence (300A,0010) in RT Prescription Module of referenced RT Plan. Required if Referenced Measured Dose Reference Sequence (3008,0080) is sent and Referenced Measured Dose Reference Number (3008,0082) is not sent. It shall not be present otherwise.		
>>Referenced Measured Dose Reference Number	(3008,0082)	1C	IS 1	Uniquely references Measured Dose Reference specified by Measured Dose Reference Number (3008,0064) in Measured Dose Reference Sequence (3008,0010). Required if Referenced Measured Dose Reference Sequence (3008,0080) is sent and Referenced Dose Reference Number (300C,0051) is not sent. It shall not be present otherwise.		
>>Measured Dose Value	(3008,0016)	1C	DS 1	Measured Dose in units specified by Dose Units (3004,0002) in sequence referenced by Measured Dose Reference Sequence (3008,0010) or Dose Reference Sequence (300A,0010) in RT Prescription Module of referenced RT Plan as defined above. Required if Referenced Measured Dose Reference Sequence (3008,0080) is sent.		
>Referenced Calculated Dose Reference Sequence	(3008,0090)	3	SQ 1	Introduces sequence of doses estimated for each treatment delivery. The sequence may contain one or more items.		
>>Referenced Dose Reference Number	(300C,0051)	1C	IS 1	Uniquely identifies Dose Reference specified by Dose Reference Number (300A,0012) in Dose Reference Sequence (300A,0010) in RT Prescription Module of referenced RT Plan. Required if Referenced Calculated Dose Reference Sequence (3008,0090) is sent and Referenced Calculated Dose Reference Number (3008,0092) is not sent.		
>>Referenced Calculated Dose Reference Number	(3008,0092)	1C	IS 1	Uniquely identifies Calculated Dose Reference specified by Calculated Dose Reference Number (3008,0072) within Calculated Dose Reference Sequence (3008,0070). Required if Referenced Calculated Dose Reference Sequence		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				(3008,0090) is sent and Referenced Dose Reference Number (300C,0051) is not sent.		
>>Calculated Dose Reference Dose Value	(3008,0076)	1C	DS 1	Calculated Dose (Gy). Required if Referenced Calculated Dose Reference Sequence (3008,0090) is sent.		
>Source-Axis Distance	(300A,00B4)	3	DS 1	Radiation source to gantry rotation axis distance of the equipment that was used for beam delivery (mm).		
>Beam Limiting Device Leaf Pairs Sequence	(3008,00A0)	1	SQ 1	Introduces sequence of beam limiting device (collimator) jaw or leaf (element) leaf pair values. The sequence may contain one or more items.		
>>RT Beam Limiting Device Type	(300A,00B8)	1	CS 1	Type of beam limiting device (collimator). Enumerated Values: X = symmetric jaw pair in IEC X direction Y = symmetric jaw pair in IEC Y direction ASYMX = asymmetric jaw pair in IEC X direction ASYMY = asymmetric pair in IEC Y direction MLCX = multileaf (multi-element) jaw pair in IEC X direction MLCY = multileaf (multi-element) jaw pair in IEC Y direction		
>>Number of Leaf/Jaw Pairs	(300A,00BC)	1	IS 1	Number of leaf (element) or jaw pairs (equal to 1 for standard beam limiting device jaws).		
>Referenced Patient Setup Number	(300C,006A)	3	IS 1	Uniquely identifies Patient Setup used within current beam, specified by Patient Setup Number (300A,0182) within Patient Setup Sequence (300A,0180) of RT Treatment Record.		
>Number of Wedges	(300A,00D0)	1	IS 1	Number of wedges associated with current delivered Beam.		
>Recorded Wedge Sequence	(3008,00B0)	1C	SQ 1	Introduces sequence of treatment wedges present during delivered Beam. Required if Number of Wedges (300A,00D0) is non-zero. The sequence may contain one or more items.		
>>Wedge Number	(300A,00D2)	3	IS 1	Identification number of the Wedge. The value of Wedge Number (300A,00D2) shall be unique within the wedge sequence.		
>>Wedge Type	(300A,00D3)	2C	CS 1	Type of wedge defined for delivered Beam. Required if Recorded Wedge Sequence (3008,00B0) is sent. Defined Terms: STANDARD = standard (static) wedge DYNAMIC = moving Beam Limiting Device (collimator) jaw simulating wedge MOTORIZED = single wedge which can be removed from beam remotely		
>>Wedge ID	(300A,00D4)	3	SH 1	User-supplied identifier for wedge.		
>>Accessory Code	(300A,00F9)	3	LO 1	An identifier for the accessory intended to be read by a device such as a bar-code reader.		
>>Wedge Angle	(300A,00D5)	3	IS 1	Nominal wedge angle delivered (degrees).		
>>Wedge Orientation	(300A,00D8)	3	DS 1	Orientation of wedge, i.e. orientation of IEC WEDGE FILTER coordinate system with respect to IEC BEAM LIMITING DEVICE coordinate system (degrees).		
>Number of Compensators	(300A,00E0)	2	IS 1	Number of compensators associated with current delivered Beam.		
>Recorded Compensator Sequence	(3008,00C0)	3	SQ 1	Introduces sequence of treatment compensators associated with current Beam. The sequence may contain one or		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				more items.		
>>Referenced Compensator Number	(300C,00D0)	1C	IS 1	Uniquely identifies compensator specified by Compensator Number (300A,00E4) within Beam referenced by Referenced Beam Number (300C,0006). Required if Recorded Compensator Sequence (3008,00C0) is sent.		
>>Compensator Type	(300A,00EE)	2C	CS 1	Type of compensator (if any). Required if Recorded Compensator Sequence (3008,00C0) is sent. Defined Terms: STANDARD = physical (static) compensator DYNAMIC = moving Beam Limiting Device (collimator) simulating compensator		
>>Compensator ID	(300A,00E5)	3	SH 1	User-supplied identifier for compensator.		
>>Accessory Code	(300A,00F9)	3	LO 1	An identifier for the accessory intended to be read by a device such as a bar-code reader.		
>Number of Boli	(300A,00ED)	2	IS 1	Number of boli used with current Beam.		
>Referenced Bolus Sequence	(300C,00B0)	3	SQ 1	Introduces sequence of boli associated with Beam. The sequence may contain one or more items.		
>>Referenced ROI Number	(3006,0084)	1C	IS 1	Uniquely identifies ROI representing the bolus specified by ROI Number (3006,0022) in Structure Set ROI Sequence (3006,0020) in Structure Set Module within RT Structure Set IOD referenced by referenced RT Plan in Referenced RT Plan Sequence (300C,0002) in RT General Treatment Record Module. Required if Referenced Bolus Sequence (300C,00B0) is sent.		
>>Bolus ID	(300A,00DC)	3	SH 1	User-supplied identifier for the Bolus.		
>>Accessory Code	(300A,00F9)	3	LO 1	An identifier for the accessory intended to be read by a device such as a bar-code reader.		
>Number of Blocks	(300A,00F0)	2	IS 1	Number of shielding blocks or Electron Inserts associated with Beam.		
>Recorded Block Sequence	(3008,00D0)	3	SQ 1	Introduces sequence of blocks associated with current Beam. The sequence may contain one or more items.		
>>Block Tray ID	(300A,00F5)	3	SH 1	User-supplied identifier for block tray or Electron Insert.		
>>Accessory Code	(300A,00F9)	3	LO 1	An identifier for the accessory intended to be read by a device such as a bar-code reader.		
>>Referenced Block Number	(300C,00E0)	3	IS 1	Uniquely identifies block specified by Block Number (300A,00FC) within Beam referenced by Referenced Beam Number (300C,0006).		
>>Block Name	(300A,00FE)	2C	LO 1	User-defined name for block. Required if Recorded Block Sequence (3008,00D0) is sent.		
>Applicator Sequence	(300A,0107)	3	SQ 1	Introduces sequence of Applicators associated with Beam. Only a single item shall be permitted in this sequence.		
>>Applicator ID	(300A,0108)	1C	SH 1	User or machine supplied identifier for Applicator. Required if Applicator Sequence (300A,0107) is sent.		
>>Accessory Code	(300A,00F9)	3	LO 1	An identifier for the accessory intended to be read by a device such as a bar-code reader.		
>>Applicator Type	(300A,0109)	1C	CS 1	Type of Applicator. Required if Applicator Sequence (300A,0107) is sent. Defined Terms: ELECTRON_SQUARE = square electron		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				applicator ELECTRON_RECT = rectangular electron applicator ELECTRON_CIRC = circular electron applicator ELECTRON_SHORT = short electron applicator ELECTRON_OPEN = open (dummy) electron applicator INTRAOPERATIVE = intraoperative (custom) applicator STEREOTACTIC = stereotactic applicator		
>>Applicator Description	(300A,010A)	3	LO 1	User-defined description for Applicator.		
>Current Fraction Number	(3008,0022)	2	IS 1	Fraction number for this beam administration.		
>Treatment Delivery Type	(300A,00CE)	2	CS 1	Delivery Type of treatment. Defined Terms: TREATMENT = normal patient treatment OPEN_PORTFILM = portal image acquisition with open field TRMT_PORTFILM = portal image acquisition with treatment port CONTINUATION = continuation of interrupted treatment SETUP = no treatment beam is applied for this RT Beam. To be used for specifying the gantry, couch, and other machine positions where X-ray set-up images or measurements are to be taken		
>Treatment Termination Status	(3008,002A)	1	CS 1	Conditions under which treatment was terminated. Enumerated Values: NORMAL = treatment terminated normally OPERATOR = operator terminated treatment MACHINE = machine terminated treatment UNKNOWN = status at termination unknown		
>Treatment Termination Code	(3008,002B)	3	SH 1	Treatment machine termination code. This code is dependent upon the particular application and equipment.		
>Treatment Verification Status	(3008,002C)	2	CS 1	Conditions under which treatment was verified by a verification system. Enumerated Values: VERIFIED = treatment verified VERIFIED_OVR = treatment verified with at least one out-of-range value overridden NOT_VERIFIED = treatment verified manually		
>Specified Primary Meterset	(3008,0032)	3	DS 1	Desired machine setting of primary meterset.		
>Specified Secondary Meterset	(3008,0033)	3	DS 1	Desired machine setting of secondary meterset.		
>Delivered Primary Meterset	(3008,0036)	3	DS 1	Machine setting actually delivered as recorded by primary meterset.		
>Delivered Secondary Meterset	(3008,0037)	3	DS 1	Machine setting actually delivered as recorded by secondary meterset.		
>Specified Treatment Time	(3008,003A)	3	DS 1	Treatment Time set (sec).		
>Delivered Treatment Time	(3008,003B)	3	DS 1	Treatment Time actually delivered (sec).		
>Number of Control Points	(300A,0110)	1	IS 1	Number of control points delivered.		
>Control Point Delivery Sequence	(3008,0040)	1	SQ 1	Introduces sequence of beam control points for current treatment beam. The sequence may contain one or more items. See PS 3.3 C.8.8.21.1.		
>>Referenced Control Point Index	(300C,00F0)	3	IS 1	Uniquely identifies Control Point specified by Control Point Index (300A,0112) within Beam referenced by Referenced Beam		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				Number (300C,0006).		
>>Treatment Control Point Date	(3008,0024)	1	DA 1	Date administration of treatment beam began.		
>>Treatment Control Point Time	(3008,0025)	1	TM 1	Time administration of treatment beam began.		
>>Specified Meterset	(3008,0042)	2	DS 1	Desired machine setting for current control point. See PS 3.3 C.8.8.21.2.		
>>Delivered Meterset	(3008,0044)	1	DS 1	Machine setting actually delivered at current control point. See PS 3.3 C.8.8.21.2.		
>>Dose Rate Set	(300A,0115)	2	DS 1	Dose Rate set on treatment machine for segment beginning at current control point (meterset/min).		
>>Dose Rate Delivered	(3008,0048)	2	DS 1	Dose Rate actually delivered for segment beginning at current control point (meterset/min).		
>>Nominal Beam Energy	(300A,0114)	3	DS 1	Nominal Beam Energy at control point.		
>>Nominal Beam Energy Unit	(300A,0015)	1C	CS 1	Units used for Nominal Beam Energy (300A,0114). Required if Nominal Beam Energy (300A,0114) is sent. Defined Terms: MV = Megavolt MEV = Mega electron-Volt If Radiation Type (300A,00C6) is PHOTON, Nominal Beam Energy Unit (300A,0015) shall be MV. If Radiation Type (300A,00C6) is ELECTRON, Nominal Beam Energy Unit (300A,0015) shall be MEV.		
>>Wedge Position Sequence	(300A,0116)	3	SQ 1	Introduces sequence of Wedge positions for current control point. The sequence may contain one or more items.		
>>>Referenced Wedge Number	(300C,00C0)	1C	IS 1	Uniquely identifies wedge specified by Wedge Number (300A,00D2) within Beam referenced by Referenced Beam Number (300C,0006). Required if Wedge Position Sequence (300A,0116) is sent.		
>>>Wedge Position	(300A,0118)	1C	CS 1	Position of Wedge at current control point. Required if Wedge Position Sequence (300A,0116) is sent. Enumerated Values: IN OUT		
>>Beam Limiting Device Position Sequence	(300A,011A)	1C	SQ 1	Introduces sequence of beam limiting device (collimator) jaw or leaf (element) positions. Required for Control Point 0 of Control Point Delivery Sequence (3008,0040) or if beam limiting device (collimator) changes during beam administration. The sequence may contain one or more items.		
>>>RT Beam Limiting Device Type	(300A,00B8)	1C	CS 1	Type of beam limiting device. The value of this attribute shall correspond to RT Beam Limiting Device Type (300A,00B8) defined in an element of Beam Limiting Device Leaf Pairs Sequence (3008,00A0). Required if Beam Limiting Device Position Sequence (300A,011A) is sent. Enumerated Values: X = symmetric jaw pair in IEC X direction Y = symmetric jaw pair in IEC Y direction ASYMX = asymmetric jaw pair in IEC X direction ASYMY = asymmetric pair in IEC Y direction MLCX = multileaf (multi-element) jaw pair in IEC X direction MLCY = multileaf (multi-element) jaw pair in IEC Y direction		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
>>>Leaf/Jaw Positions	(300A,011C)	1C	DS 2-2n	Positions of beam limiting device (collimator) leaf (element) or jaw pairs (mm) in IEC BEAM LIMITING DEVICE coordinate axis appropriate to RT Beam Limiting Device Type (300A,00B8), e.g. X-axis for MLCX, Y-axis for MLCY. Contains 2N values, where N is the Number of Leaf/Jaw Pairs (300A,00BC) defined in element of Beam Limiting Device Leaf Pairs Sequence (3008,00A0). Values shall be in IEC leaf subscript order 101, 201, 102, 202, … 1N, 2N. Required if Beam Limiting Device Position Sequence (300A,011A) is sent.		
>>Gantry Angle	(300A,011E)	1C	DS 1	Treatment machine gantry angle, i.e. orientation of IEC GANTRY coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees). Required for Control Point 0 of Control Point Delivery Sequence (3008,0040) or if Gantry Angle changes during beam administration.		
>>Gantry Rotation Direction	(300A,011F)	1C	CS 1	Direction of Gantry Rotation when viewing gantry from isocenter, for segment beginning at current Control Point. Required for Control Point 0 of Control Point Delivery Sequence (3008,0040), or if Gantry Rotation Direction changes during beam administration. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation		
>>Gantry Pitch Angle	(300A,014A)	3	FL 1	Gantry Pitch Angle. i.e. the rotation of the IEC GANTRY coordinate system about the X-axis of the IEC GANTRY coordinate system (degrees). If used, must be present for first item of Control Point Sequence, or if used and Gantry Pitch Rotation Angle changes during Beam, must be present. See PS 3.3 C.8.8.25.6.5.		
>>Gantry Pitch Rotation Direction	(300A,014C)	3	CS 1	Direction of Gantry Pitch Angle when viewing along the positive X-axis of the IEC GANTRY coordinate system, for segment following Control Point. If used, must be present for first item of Control Point Sequence, or if used and Gantry Pitch Rotation Direction changes during Beam, must be present. See PS 3.3 C.8.8.14.8 and PS 3.3 C.8.8.25.6.5. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation		
>>Beam Stopper Position	(3008,0230)	3	CS 1	Position of Beam Stopper during beam administration. Enumerated Values: EXTENDED = Beam Stopper extended RETRACTED = Beam Stopper retracted UNKNOWN = Position unknown		
>>Beam Limiting Device Angle	(300A,0120)	1C	DS 1	Beam Limiting Device (collimator) angle, i.e. orientation of IEC BEAM LIMITING DEVICE coordinate system with respect to IEC GANTRY coordinate system (degrees). Required for Control Point 0 of Control Point Delivery Sequence (3008,0040) or if beam limiting device (collimator) angle changes during beam delivery.		
>>Beam Limiting Device Rotation Direction	(300A,0121)	1C	CS 1	Direction of Beam Limiting Device Rotation when viewing beam limiting device (collimator) from radiation source,		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				for segment beginning at current Control Point. Required for Control Point 0 of Control Point Delivery Sequence (3008,0040) or if Beam Limiting Device Rotation Direction changes during beam administration. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation		
>>Patient Support Angle	(300A,0122)	1C	DS 1	Patient Support angle, i.e. orientation of IEC PATIENT SUPPORT (turntable) coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees). Required for Control Point 0 of Control Point Delivery Sequence (3008,0040) or if Patient Support Angle changes during beam administration.		
>>Patient Support Rotation Direction	(300A,0123)	1C	CS 1	Direction of Patient Support Rotation when viewing table from above, for segment beginning at current Control Point. Required for Control Point 0 of Control Point Delivery Sequence (3008,0040), or if Patient Support Rotation Direction changes during beam administration. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation		
>>Table Top Eccentric Axis Distance	(300A,0124)	3	DS 1	Distance (positive) from the IEC PATIENT SUPPORT vertical axis to the IEC TABLE TOP ECCENTRIC vertical axis (mm).		
>>Table Top Eccentric Angle	(300A,0125)	1C	DS 1	Table Top (non-isocentric) angle, i.e. orientation of IEC TABLE TOP ECCENTRIC coordinate system with respect to IEC PATIENT SUPPORT coordinate system (degrees). Required for Control Point 0 of Control Point Delivery Sequence (3008,0040) or if Table Top Eccentric Angle changes during beam administration.		
>>Table Top Eccentric Rotation Direction	(300A,0126)	1C	CS 1	segment beginning at current Control Point. Required for Control Point 0 of Control Point Delivery Sequence (3008,0040) or if Table Top Eccentric Rotation Direction changes during beam administration. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation		
>>Table Top Vertical Position	(300A,0128)	2C	DS 1	Table Top Vertical position in IEC TABLE TOP coordinate system (mm). This value is interpreted as an absolute, rather than relative, Table setting. Required for Control Point 0 of Control Point Delivery Sequence (3008,0040) or if Table Top Vertical Position changes during beam administration.		
>>Table Top Longitudinal Position	(300A,0129)	2C	DS 1	Table Top Longitudinal position in IEC TABLE TOP coordinate system (mm). This value is interpreted as an absolute, rather than relative, Table setting. Required for Control Point 0 of Control Point Delivery Sequence (3008,0040) or if Table Top Longitudinal Position changes during beam administration.		
>>Table Top Lateral Position	(300A,012A)	2C	DS 1	Table Top Lateral position in IEC TABLE TOP coordinate system (mm). This value is interpreted as an absolute, rather than relative, Table setting. Required for		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				Control Point 0 of Control Point Delivery Sequence (3008,0040) or if Table Top Lateral Position changes during beam administration.		
>>Corrected Parameter Sequence	(3008,0068)	3	SQ 1	Introduces a sequence of items describing any corrections made to any attributes prior to delivery of the next control point. The sequence may contain one or more items.		
>>>Parameter Sequence Pointer	(3008,0061)	1	AT 1	Contains the Data Element Tag of the parent sequence containing the attribute that was corrected. The value is limited in scope to the Treatment Session Beam Sequence (3008,0020) and all nested sequences therein.		
>>>Parameter Item Index	(3008,0063)	1	IS 1	Contains the sequence item index (starting at 1) of the corrected attribute within its parent sequence.		
>>>Parameter Pointer	(3008,0065)	1	AT 1	Contains the Data Element Tag of the attribute that was corrected.		
>>>Correction Value	(3008,006A)	1	FL 1	The value applied to the attribute that was referenced by the Parameter Sequence Pointer (3008,0061), Parameter Item Index (3008,0063) and Parameter Pointer (3008,0065).		
>>Override Sequence	(3008,0060)	3	SQ 1	Introduces sequence of parameters that were overridden during the administration of the beam segment immediately prior to the current control point. The sequence may contain one or more items.		
>>>Override Parameter Pointer	(3008,0062)	2C	AT 1	Contains the Data Element Tag of the attribute that was overridden. Required if Override Sequence (3008,0060) is sent.		
>>>Parameter Sequence Pointer	(3008,0061)	3	AT 1	Contains the Data Element Tag of the parent sequence containing the attribute that was overridden. The value is limited in scope to the Treatment Session Beam Sequence (3008,0020) and all nested sequences therein.		
>>>Parameter Item Index	(3008,0063)	3	IS 1	Contains the sequence item index (monotonically increasing from 1) of the overridden attributes within its parent sequence. The value is limited in scope to the Treatment Session Beam Sequence (3008,0020) and all nested sequences therein.		
>>>Operators' Name	(0008,1070)	2C	PN 1-n	Name of operator who authorized override. Required if Override Sequence (3008,0060) is sent.		
>>>Override Reason	(3008,0066)	3	ST 1	User-defined description of reason for override of parameter specified by Override Parameter Pointer (3008,0062).		

8.8.17 RT Dose Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Samples per Pixel	(0028,0002)	1C	US 1	Number of samples (planes) in this image. See PS 3.3 C.8.8.3.4.1 for specialization. Required if Pixel Data (7FE0,0010) is present.			
Photometric Interpretation	(0028,0004)	1C	CS 1	Specifies the intended interpretation of the pixel data. See PS 3.3 C.8.8.3.4.2 for specialization. Required if Pixel Data (7FE0,0010) is present.			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Bits Allocated	(0028,0100)	1C	US 1	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. See PS 3.3 C.8.8.3.4.3 for specialization. Required Pixel Data (7FE0,0010) is present.			
Bits Stored	(0028,0101)	1C	US 1	Number of bits stored for each pixel sample. Each sample shall have the same number of bits stored. See PS 3.3 C.8.8.3.4.4 for specialization. Required if Pixel Data (7FE0,0010) is present.			
High Bit	(0028,0102)	1C	US 1	Most significant bit for each pixel sample. Each sample shall have the same high bit. See PS 3.3 C.8.8.3.4.5 for specialization. Required if Pixel Data (7FE0,0010) is present.			
Pixel Representation	(0028,0103)	1C	US 1	Data representation of the pixel samples. Each sample shall have the same pixel representation. See PS 3.3 C.8.8.3.4.6 for specialization. Required Pixel Data (7FE0,0010) is present.			
Dose Units	(3004,0002)	1	CS 1	Units used to describe dose. Enumerated Values: GY = Gray RELATIVE = dose relative to implicit reference value			
Dose Type	(3004,0004)	1	CS 1	Type of dose. Defined Terms: PHYSICAL = physical dose EFFECTIVE = physical dose after correction for biological effect using user-defined modeling technique ERROR = difference between desired and planned dose			
Instance Number	(0020,0013)	3	IS 1	A number that identifies this object instance.			
Dose Comment	(3004,0006)	3	LO 1	User-defined comments for dose data.			
Normalization Point	(3004,0008)	3	DS 3	Coordinates (x, y, z) of normalization point in the patient based coordinate system described in PS 3.3 C.7.6.2.1.1 (mm). See PS 3.3 C.8.8.3.1.			
Dose Summation Type	(3004,000A)	1	CS 1	Type of dose summation. Defined Terms: PLAN = dose calculated for entire RT Plan FRACTION = dose calculated for a single Fraction Group within RT Plan BEAM = dose calculated for one or more Beams within RT Plan BRACHY = dose calculated for one or more Brachy Application Setups within RT Plan CONTROL_POINT = dose calculated for one or more Control Points within a Beam			
Referenced RT Plan Sequence	(300C,0002)	1C	SQ 1	Introduces sequence of one Class/Instance pair describing RT Plan associated with dose. Required if Dose Summation			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				Type (3004,000A) is PLAN, FRACTION, BEAM, BRACHY or CONTROL_POINT. Only a single item shall be permitted in this sequence. See Note 1.			
>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced RT Plan Sequence (300C,0002) is sent.			
>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced RT Plan Sequence (300C,0002) is sent.			
>Referenced Fraction Group Sequence	(300C,0020)	1C	SQ 1	Introduces sequence of one Fraction Group containing beams or brachy application setups contributing to dose. Required if Dose Summation Type (3004,000A) is FRACTION, BEAM, BRACHY or CONTROL_POINT. Only a single item shall be permitted in this sequence. See Note 1.			
>>Referenced Fraction Group Number	(300C,0022)	1C	IS 1	Uniquely identifies Fraction Group specified by Fraction Group Number (300A,0071) in Fraction Group Sequence of RT Fraction Scheme Module within RT Plan referenced in Referenced RT Plan Sequence (300C,0002). Required if Referenced Fraction Group Sequence (300C,0020) is sent.			
>>Referenced Beam Sequence	(300C,0004)	1C	SQ 1	Introduces sequence of Beams in current Fraction Group contributing to dose. Required if Dose Summation Type (3004,000A) is BEAM or CONTROL_POINT. One or more items may be included in this sequence.			
>>>Referenced Beam Number	(300C,0006)	1C	IS 1	Uniquely identifies Beam specified by Beam Number (300A,00C0) in Beam Sequence of RT Beams Module within RT Plan referenced in Referenced RT Plan Sequence (300C,0002). Required if Referenced Beam Sequence (300C,0004) is sent.			
>>>Referenced Control Point Sequence	(300C,00F2)	1C	SQ 1	Sequence defining the Control Points in current Beam contributing to dose. Required if Dose Summation Type (3004,000A) is CONTROL_POINT. Only a single item shall be present in this sequence.			
>>>>Referenced Start Control Point Index	(300C,00F4)	1	IS 1	Identifies Control Point specified by Control Point Index (300A,0112) within Beam referenced by Referenced Beam Number (300C,0006). This is the first of the two Control Points from which the Dose contribution to the Control Point can be calculated.			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
>>>>Referenced Stop Control Point Index	(300C,00F6)	1	IS 1	Identifies Control Point specified by Control Point Index (300A,0112) within Beam referenced by Referenced Beam Number (300C,0006). This is the second of the two Control Points from which the Dose contribution to the Control Point can be calculated. The Control Point Index (300A,0112) referenced by Referenced Stop Control Point Index (300C,00F6) shall be the Control Point Index (300A,0112) immediately following the Control Point Index (300A,0112) referenced by Referenced Start Control Point Index (300C,00F4) within the Referenced Beam Number (300C,0006).			
>>Referenced Brachy Application Setup Sequence	(300C,000A)	1C	SQ 1	Introduces sequence of Brachy Application Setups in current Fraction Group contributing to dose. Required if Dose Summation Type (3004,000A) is BRACHY. One or more items may be included in this sequence.			
>>>Referenced Brachy Application Setup Number	(300C,000C)	1C	IS 1	Uniquely identifies Brachy Application Setup specified by Brachy Application Setup Number (300A,0234) in Brachy Application Setup Sequence (300A,0230) of RT Brachy Application Setups Module within RT Plan referenced in Referenced RT Plan Sequence (300C,0002). Required if Referenced Brachy Application Setup Sequence (300C,000A) is sent.			
Grid Frame Offset Vector	(3004,000C)	1C	DS 2-n	An array which contains the dose image plane offsets (in mm) of the dose image frames in a multi-frame dose. Required if multi-frame pixel data are present and Frame Increment Pointer (0028,0009) points to Grid Frame Offset Vector (3004,000C). See PS 3.3 C.8.8.3.2.			
Dose Grid Scaling	(3004,000E)	1	DS 1	Scaling factor that when multiplied by the dose grid data found in the Pixel Data (7FE0,0010) attribute of the Image Pixel Module, yields grid doses in the dose units as specified by Dose Units (3004,0002).			
Tissue Heterogeneity Correction	(3004,0014)	3	CS 1-3	Specifies a list of patient heterogeneity characteristics used for calculating dose. This Atttibute shall be multi-valued if beams used to compute the dose have differing correction techniques. Enumerated Values: IMAGE = image data ROI_OVERRIDE = one or			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				more ROI densities override image or water values where they exist WATER = entire volume treated as water equivalent			
Optimized dose type	(300B,xxD5)	3	CS 1	Specifies from which kind of optimization the dose cube derives. Enumerated values PHYSICAL = physically optimized BIOLOGICAL = biologically optimized	This must not be confused with the RT Dose Module standard tag "dose type" (3004,0004). A "biological optimization" typically yields two dose distributions: a physical and an effective one. So both attributes need to be known.		

8.8.18 RT Dose ROI

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
RT Dose ROI Sequence	(3004,0010)	1	SQ 1	Introduces sequence of items specifying dose levels for isodose curves or dose points described in the ROI module. One or more items may be included in this sequence. See PS 3.3 C.8.8.7.1.		
>Referenced ROI Number	(3006,0084)	1	IS 1	Uniquely identifies the referenced ROI within the current RT Dose. See Note 1 and PS 3.3 C.8.8.7.2.		
>Dose Units	(3004,0002)	1	CS 1	Units used for ROI Dose. Enumerated Values: GY = Gray RELATIVE = dose relative to implicit reference value		
>Dose Value	(3004,0012)	1	DS 1	Dose value for ROI, in units defined by Dose Units (3004,0002). See PS 3.3 C.8.8.7.3.		
>Confidence Measure Units	(300B,xxE7)	3	CS 1	Units used for confidence measure. Defined Terms GYMM = Gray/mm for a dose gradient		
>Confidence Measure Value	(300B,xxE8)	3	DS1	Value of the confidence measure for the dose value, in units defined by Confidence Measure Units		

8.8.19 RT DVH Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Referenced Structure Set Sequence	(300C,0060)	1	SQ 1	Introduces sequence of one class/instance pair describing Structure Set containing structures which are used to calculate Dose-Volume Histograms (DVHs). Only a single item shall be permitted in this sequence. See PS 3.3 C.8.8.4.1.		
>Referenced SOP Class UID	(0008,1150)	1	UI 1	Uniquely identifies the referenced SOP Class.		
>Referenced SOP Instance UID	(0008,1155)	1	UI 1	Uniquely identifies the referenced SOP Instance.		
DVH Normalization Point	(3004,0040)	3	DS 3	Coordinates (x, y, z) of common DVH normalization point in the patient based coordinate system described in PS 3.3 C.7.6.2.1.1 (mm).		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
DVH Normalization Dose Value	(3004,0042)	3	DS 1	Dose Value at DVH Normalization Point (3004,0040) used as reference for individual DVHs when Dose Units (3004,0002) is RELATIVE.		
DVH Sequence	(3004,0050)	1	SQ 1	Introduces sequence of DVHs. One or more items may be included in this sequence.		
>DVH Referenced ROI Sequence	(3004,0060)	1	SQ 1	Introduces sequence of referenced ROIs used to calculate DVH.		
>>Referenced ROI Number	(3006,0084)	1	IS 1	Uniquely identifies ROI used to calculate DVH specified by ROI Number (3006,0022) in Structure Set ROI Sequence (3006,0020) in Structure Set Module within RT Structure Set referenced by referenced RT Plan in Referenced RT Plan Sequence (300C,0002) in RT Dose Module.		
>>DVH ROI Contribution Type	(3004,0062)	1	CS 1	Specifies whether volume within ROI is included or excluded in DVH. See PS 3.3 C.8.8.4.2. Enumerated Values: INCLUDED, EXCLUDED.		
>DVH Type	(3004,0001)	1	CS 1	Type of DVH. Enumerated Values: DIFFERENTIAL = differential dose-volume histogram CUMULATIVE = cumulative dose-volume histogram NATURAL = natural dose volume histogram		
>Dose Units	(3004,0002)	1	CS 1	Dose axis units. Enumerated Values: GY = Gray RELATIVE = dose relative to reference value specified in DVH Normalization Dose Value (3004,0042)		
>Dose Type	(3004,0004)	1	CS 1	Type of dose. Defined Terms: PHYSICAL = physical dose EFFECTIVE = physical dose after correction for biological effect using user-defined modeling technique ERROR = difference between desired and planned dose		
>DVH Dose Scaling	(3004,0052)	1	DS 1	Scaling factor that when multiplied by the dose bin widths found in DVH Data (3004,0058), yields dose bin widths in the dose units as specified by Dose Units (3004,0002).		
>DVH Volume Units	(3004,0054)	1	CS 1	Volume axis units. Defined Terms: CM3 = cubic centimeters PERCENT = percent PER_U= volume per u with u(dose)=dose-3/2. See PS 3.3 C.8.8.4.3.		
>DVH Number of Bins	(3004,0056)	1	IS 1	Number of bins n used to store DVH Data (3004,0058).		
>DVH Data	(3004,0058)	1	DS 2-2n	A data stream describing the dose bin widths Dn and associated volumes Vn in DVH Volume Units (3004,0054) in the order D1V1, D2V2, ... DnVn. Note: DVH Data arrays may not be properly encoded if Explicit-VR transfer syntax is used and the VL of this attribute exceeds 65534 bytes.		
>DVH Minimum Dose	(3004,0070)	3	DS 1	Minimum calculated dose to ROI(s) described by DVH Referenced ROI Sequence (3004,0060).		
>DVH Maximum Dose	(3004,0072)	3	DS 1	Maximum calculated dose to ROI(s) described by DVH Referenced ROI Sequence (3004,0060).		
>DVH Mean Dose	(3004,0074)	3	DS 1	Mean calculated dose to ROI(s) described		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				by DVH Referenced ROI Sequence (3004,0060).		

8.8.20 RT Fraction Scheme Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Private Extensions for this module can be found in "RT General Plan::External Attributes"									
Ordered Referenced Beam Numbers	(300B, xx60)	3	IS 1-n	The physical order in which all referenced beams will be displayed in the RTT-PT. It will be inserted during plan enhancement.				RTT-PT	Written
Fraction Group Sequence	(300A, 0070)	1	SQ 1	Introduces sequence of Fraction Groups in current Fraction Scheme. One or more items may be included in this sequence.			Used if it is a Tx Fraction Group	RTT-PT	Tx FG: Read. RTT-PT assumes that only one Tx FG will be present. Imaging group: Read Motion FG: Read
>Fraction Group Number	(300A, 0071)	1	IS 1	Identification number of the Fraction Group. The value of Fraction Group Number (300A,0071) shall be unique within the RT Plan in which it is created.		1		RTT-PT	Tx FG: Read Imaging group: Read Motion FG: Read
>Fraction Group Description	(300A, 0072)	3	LO 1	The user defined description for the fraction group.				RTT-PT	Tx FG: Read Imaging group: Read Motion FG: Read
>Fraction Group Code	(300B, xx76)	3	CS 1	String Identification for the current fraction group. To easily identify Tx FG and Motion FG and other FGs. TREATMENT for Tx FG MOTION for motion FG IMAGING for imaging FG		TREATMENT		RTT-PT	Tx FG: Read Imaging group: Read Motion FG: Read & Written
>Referenced Treatment Beam Number	(300B, xx77)	3	IS 1	Referenced Beam Number (300A,00C0) of Treatment Beam being verified by this imaging fraction group. Required if Fraction Group Code				RTT-PT	Tx FG: Read Imaging group: Read Motion FG: Read & Written

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				(300B,xx76) is IMAGING and this imaging fraction group verifies as specific treatment beam. If this imaging fraction group does not verify a specific treatment beam, but rather the overall setup, then this attribute is not sent.					
>Referenced Patient Setup Number	(300C, 006A)	3	IS 1	Uniquely identifies Patient Setup specified by Patient Setup Number (300A,0182) within Patient Setup Sequence (300A,0180) in RT Patient Setup Module.					
>Referenced Dose Sequence	(300C, 0080)	3	SQ 1	Introduces sequence of related SOP Class/Instance pairs describing related instances of RT Dose (for grids, isodose curves and named/unnamed point doses). One or more items may be included in this sequence. Note: An RT Dose IOD referenced within the Referenced Dose Sequence (300C,0080) can be used for storing grid-based (pixel) data, isodose curves, and/or individual dose points (with optional dose point names) for the current Fraction Group.					
>>Referenced SOP Class UID	(0008, 1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced Dose Sequence (300C,0080) is sent.					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
>>Referenced SOP Instance UID	(0008, 1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced Dose Sequence (300C,0080) is sent.					
>Referenced Dose Reference Sequence	(300C, 0050)	3	SQ 1	Introduces sequence of Dose References for the current Fraction Group. One or more items may be included in this sequence.	These are all the dose references from the prescription, but augmented with the calculated dose values.			RTT-PT	Tx FG: Read Imaging group: Not used Motion FG: Not used
>>Referenced Dose Reference Number	(300C, 0051)	1	IS 1	Uniquely identifies Dose Reference specified by Dose Reference Number (300A,0012) within Dose Reference Sequence (300A,0010) in RT Prescription Module. Required if Referenced Dose Reference Sequence (300C,0050) is sent.				RTT-PT	Tx FG: Read Imaging group: Not used Motion FG: Not used
>>Fraction Dose to Dose Reference	(300B, xx78)	3	DS 1	Fraction Dose for this Dose Reference in this Fraction Group. Depending on Dose Type (3004,0004) in RT Prescription Module, this value is interpreted either as absorbed (in Gy) or effective (in GyE) Fraction Dose to Dose Reference. If Dose Reference Type (300A,0020) of referenced Dose Reference is TARGET, and Dose Reference Structure Type (300A,0014) of referenced Dose Reference is VOLUME, and Target Prescription Dose Type (300B,xx15) is				RTT-PT	Tx FG: Read Imaging group: Not used Motion FG: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				MEAN/MEDIAN, then this is the calculated mean/median dose of the referenced volume. If Dose Reference Type (300A,0020) of referenced Dose Reference is TARGET, and Dose Reference Structure Type (300A,0014) of referenced Dose Reference is POINT, then this is the calculated dose in the referenced point. If Dose Reference Type (300A,0020) of referenced Dose Reference is ORGAN_AT_RISK, then this is the calculated maximum dose in the referenced structure.					
>>Constraint Weight	(300A, 0021)	3	DS 1	Relative importance of satisfying constraint, where high values represent more important constraints.					
>>Delivery Warning Dose	(300A, 0022)	3	DS 1	The dose (in Gy) which when reached or exceeded should cause some action to be taken.					
>>Delivery Maximum Dose	(300A, 0023)	3	DS 1	The maximum dose (in Gy) which can be delivered to the dose reference.					
>>Target Minimum Dose	(300A, 0025)	3	DS 1	Minimum permitted dose (in Gy) to Dose Reference if Dose Reference Type (300A,0020) of referenced Dose Reference is TARGET.					
>>Target Prescription Dose	(300A, 0026)	3	DS 1	Prescribed dose (in Gy) to Dose Reference if Dose Reference Type (300A,0020) of referenced Dose Reference is					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				TARGET.					
>>Target Maximum Dose	(300A, 0027)	3	DS 1	Maximum permitted dose (in Gy) to Dose Reference if Dose Reference Type (300A,0020) of referenced Dose Reference is TARGET.					
>>Target Underdose Volume Fraction	(300A, 0028)	3	DS 1	Maximum permitted fraction (in percent) of Target to receive less than the Target Prescription Dose (300A,0027) if Dose Reference Type (300A,0020) of referenced Dose Reference is TARGET and Dose Reference Structure Type (300A,0014) of referenced Dose Reference is VOLUME.					
>>Organ at Risk Full-volume Dose	(300A, 002A)	3	DS 1	Maximum dose (in Gy) to entire Dose Reference if Dose Reference Type (300A,0020) of referenced Dose Reference is ORGAN_AT_RISK and Dose Reference Structure Type (300A,0014) of referenced Dose Reference is VOLUME.					
>>Organ at Risk Limit Dose	(300A, 002B)	3	DS 1	Maximum permitted dose (in Gy) to any part of Dose Reference if Dose Reference Type (300A,0020) of referenced Dose Reference is ORGAN_AT_RISK and Dose Reference Structure Type (300A,0014) of referenced Dose Reference is VOLUME.					
>>Organ at Risk Maximum	(300A, 002C)	3	DS 1	Maximum dose (in Gy) to non-overdosed part of Dose					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Dose				Reference if Dose Reference Type (300A,0020) of referenced Dose Reference is ORGAN_AT_RISK and Dose Reference Structure Type (300A,0014) of referenced Dose Reference is VOLUME.					
>>Organ at Risk Overdose Volume Fraction	(300A, 002D)	3	DS 1	Maximum permitted fraction (in percent) of Organ at Risk to receive more than the Organ at Risk Maximum Dose if Dose Reference Type (300A,0020) of referenced Dose Reference is ORGAN_AT_RISK and Dose Reference Structure Type (300A,0014) of referenced Dose Reference is VOLUME.					
>Number of Fractions Planned	(300A, 0078)	2	IS 1	Total number of treatments (Fractions) prescribed for current Fraction Group.		30		RTT-PT	Tx FG: Read Imaging group: Not used Motion FG: Not used
>Number of Fraction Pattern Digits Per Day	(300A, 0079)	3	IS 1	Number of digits in Fraction Pattern (300 A,007B) used to represent one day. Note: The fractionation pattern does not indicate the actual start of treatment, or the order or timing of fraction delivery. If treatment does not commence as outlined in the pattern, it is the application's responsibility to make any necessary adjustments.					
>Repeat Fraction Cycle Length	(300A, 007A)	3	IS 1	Number of weeks needed to describe treatment pattern.					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				Note: The fractionation pattern does not indicate the actual start of treatment, or the order or timing of fraction delivery. If treatment does not commence as outlined in the pattern, it is the application's responsibility to make any necessary adjustments.					
>Fraction Pattern	(300A, 007B)	3	LT 1	String of 0's (no treatment) and 1's (treatment) describing treatment pattern. Length of string is 7 x Number of Fraction Pattern Digits Per Day x Repeat Cycle Length. Pattern shall start on a Monday. Note: The fractionation pattern does not indicate the actual start of treatment, or the order or timing of fraction delivery. If treatment does not commence as outlined in the pattern, it is the application's responsibility to make any necessary adjustments.					
>Number of Beams	(300A, 0080)	1	IS 1	Number of Beams in current Fraction Group. If Number of Beams is greater than zero, Number of Brachy Application Setups shall equal zero.				RTT-PT	Tx FG: Read Imaging group: Read Motion FG: Read
>Referenced Beam Sequence	(300C, 0004)	1C	SQ 1	Introduces sequence of treatment beams in current Fraction Group. Required if Number of Beams (300A,0080) is				RTT-PT	Tx FG: Modified Imaging group: Modified Motion FG: Modified

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				greater than zero. One or more items may be included in this sequence.					
>>Referenced Beam Number	(300C, 0006)	1C	IS 1	Uniquely identifies Beam specified by Beam Number (300A,00C0) within Beam Sequence (300A,00B0) in RT Beams Module. Required if Referenced Beam Sequence (300C,0004) is sent.				RTT-PT	Tx FG: Read Imaging group: Read Motion FG: Read
>>Beam Dose Specification Point	(300A, 0082)	3	DS 3	Coordinates (x, y, z) of point at which Beam Dose is specified in the patient based coordinate system described in C76211 (mm). Note: The Beam Dose Specification Point (300A,0082) and Brachy Application Setup Dose Specification Point (300A,00A2) contain the coordinates of the single point used for dose normalization. This point is distinct from the Referenced Dose Reference Sequence (300C,0050) in the RT Beams module and the Brachy Referenced Dose Reference Sequence (300A,0055) in the RT Brachy Application Setups module, which are used for plan evaluation and dose tracking.					
>>Beam Dose	(300A, 0084)	3	DS 1	Dose (in Gy) at Beam Dose Specification Point (300A,0082) due					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				to current Beam.					
>>Beam Meterset	(300A, 0086)	3	DS 1	Machine setting to be delivered for current Beam, specified in Monitor Units (MU) or minutes as defined by Primary Dosimeter Unit (300A,00B3) (in RT Beams Module) for referenced Beam. Note: The Meterset at a given Control Point (compare RT Beams Module) is equal to the Beam Meterset (300A,0086) multiplied by the Cumulative Meterset Weight (300A,0134) for the Control Point, divided by the Final Cumulative Meterset Weight (300A,010E).	For Ion TxBeams: Total ioncount cumulated across all spotmaps of this beam. This is exactly the same value as in "RT Ion Beams::Final Cumulative Meterset Weight" (300A,010E). For Non-TxBeams, Beam Meterset is not defined.			RTT-PT	Tx FG: Read, defines the number of particles for the referenced beam Imaging group: Not used Motion FG: Not used
>Number of Brachy Application Setups	(300A, 00A0)	1	IS 1	Number of Brachy Application Setups in current Fraction Group. If Number of Brachy Application Setups is greater then zero, Number of Beams (300A,0080) shall equal zero.					
>Referenced Brachy Application Setup Sequence	(300C, 000A)	1C	SQ 1	Introduces sequence of treatment Brachy Application Setups in current Fraction Group. Required if Number of Brachy Application Setups (300A,00A0) is greater than zero. One or more items may be included in this sequence.					
>>Referenced Brachy	(300C, 000C)	1C	IS 1	Uniquely identifies Brachy					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Application Setup Number				Application Setup specified by Brachy Application Setup Number (300A,0234) within Brachy Application Setup Sequence (300A,0230) in RT Brachy Application Setups Module. Required if Referenced Brachy Application Setup Sequence (300C,000A) is sent.					
>>Brachy Application Setup Dose Specification Point	(300A, 00A2)	3	DS 3	Coordinates (x, y, z) of point in the patient based coordinate system described in C76211 at which Brachy Application Setup Dose (300A,00A4) is specified (mm).					
>>Brachy Application Setup Dose	(300A, 00A4)	3	DS 1	Dose (in Gy) at Brachy Application Setup Dose Specification Point (300A,00A2) due to current Brachy Application Setup.					

8.8.21 RT General Plan Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Private Extensions for this module can be found in "RT General Plan::External Attributes"									
RT Plan Label	(300A, 0002)	1	SH 1	User-defined label for treatment plan. Used as Plan Name.	RT Plan Label togehter with RT Plan Date (300A,0006) and RT Plan Time (300A,0007) is used for versioning 3rd party plans in the syngo RT context: any two plans with the	Read		RTT-PT	Modified

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
					same plan label are considered to be two related plan versions, ordered by date and time on the versioning chain. Note that branching version chains is not possible by construction. In addition, all syngo RT applications use the RT Plan Relationship (300A,0055) PREDECESSOR to indicate the versioning relationship. Note that branching version chains is technically possible, but is forbidden in syngo RT.				
RT Plan Name	(300A, 0003)	3	LO 1	User-defined name for treatment plan.					
External Attributes	(0039, xx01)	3	UT 1	RT General Plan private attributes encoded in an XML string.The XML instance format is defined in RTPlanExtensions.xsd	Specifies private attributes in an XML instance which are intended to be used as input to several applications.				
Plan Type	(300B, xx10)	3	CS 1	Type of treatment plan Defined Terms: PATIENT RESEARCH TRAINING VERIFICATION CLINICAL_TRIAL	PATIENT and CLINICAL_TRIAL are use for real patient treatments.VERIFICATION makes only sense if Treatment Intent (300A,000A) equals VERIFICATION.	PATIENT	Used	RTT-PT	Read
Verification Method	(300B, xx19)	3	CS 1	Determines the verification method for a plan with Plan	A plan can either be verified beam by		Used	RTT-PT	Read

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				Type (300B,xx10) VERIFICATION. Defined Terms: ENTIRE_PLAN SEPARATE_BEAMS	beam, typically with user interaction between the individual beams, or as entire plan without any user interaction. Note that also a beam by beam verification can be done without user interaction provided the delivery system supports repositioning of detectors and reset of measured dose through software. The two methods then only differ in the way how the measured dose is interpreted.				
RT Plan Description	(300A, 0004)	3	ST 1	User-defined description for treatment plan.				RTT-PT	Modified
Checksum Encryption Code	(300B, xxA1)	3	OB 1	A 128 bit encryption code generated by MD5 algorithm to verify the checksum.	The details about the set of attributes to go into the checksum can be found in ClearCase: \DOCS\SWDS\ArcH&Comps\WSInfrastructure	728		RTT-PT	Read
Instance Number	(0020, 0013)	3	IS 1	A number that identifies this object instance.				RTT-PT	Read
Operator's Name	(0008, 1070)	2	PN 1-n	Name of operator(s) creating treatment plan.				RTT-PT	Modified
RT Plan Date	(300A, 0006)	2	DA 1	Date treatment plan was last modified.				RTT-PT	Modified
RT Plan Time	(300A, 0007)	2	TM 1	Time treatment plan was last modified.				RTT-PT	Modified
Treatment Protocols	(300A, 0009)	3	LO 1-n	Planned treatment protocols.				RTT-PT	Modified

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Treatment Intent	(300A, 000A)	3	CS 1	Intent of this course of treatment. Defined Terms: CURATIVE PALLIATIVE PROPHYLACTIC VERIFICATION			Used	RTT-PT	Read
Treatment Sites	(300A, 000B)	3	LO 1-n	Planned treatment sites.					
RT Plan Geometry	(300A, 000C)	1	CS 1	Describes whether RT Plan is based on patient or treatment device geometry. Defined Terms: PATIENT RT Structure Set exists TREATMENT_DEVICE RT Structure Set does not exist	An RT Plan Geometry (300A,000C) of PATIENT shall signify that an RT Structure Set has been defined upon which the plan geometry is based, and this RT Structure Set shall be specified in the Referenced Structure Set Sequence (300C,0060). An RT Plan Geometry (300A,000C) of TREATMENT_DEVICE shall indicate that no patient geometry is available, and that the RT Plan is being defined with respect to the IEC FIXED Coordinate System.	PATIENT	Used	RTT-PT	Read
Referenced Structure Set Sequence	(300C, 0060)	1C	SQ 1	Introduces sequence of one Class/Instance pair describing instance of RT Structure Set on which the RT Plan is based. Only a single item shall be permitted in this sequence. Required if RT Plan Geometry (300A,000C) is PATIENT.			Used		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
>Referenced SOP Class UID	(0008, 1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced Structure Set Sequence (300C,0060) is sent.					
>Referenced SOP Instance UID	(0008, 1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced Structure Set Sequence (300C,0060) is sent.					
Referenced Dose Sequence	(300C, 0080)	3	SQ 1	Introduces sequence of related SOP Class/Instance pairs describing related instances of RT Dose (for grids and named/unnamed point doses). One or more items may be included in this sequence. Note: An RT Dose IOD referenced within the Referenced Dose Sequence (300C,0080) can be used for storing grid-based (pixel) data, individual dose points (with optional dose point names), isodose curves, and DVH's.	Note that an RT Dose instance referenced here is not required to refer to this plan. The RT Dose instance could also refer to a predecessor version of this plan.		Used		
>Referenced SOP Class UID	(0008, 1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced RT Dose Sequence (300C,0080) is sent.					
>Referenced SOP Instance UID	(0008, 1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced RT Dose Sequence (300C,0080) is sent.					
Referenced RT	(300C,	3	SQ 1	Introduces				RTT-	Written

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Plan Sequence	0002)			sequence of related SOP Class/Instance pairs describing related instances of RT Plan. One or more items may be included in this sequence.				PT	
>Referenced SOP Class UID	(0008, 1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced RT Plan Sequence (300C,0002) is sent.				RTT-PT	Written
>Referenced SOP Instance UID	(0008, 1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced RT Plan Sequence (300C,0002) is sent.				RTT-PT	Written
>RT Plan Relationship	(300A, 0055)	1C	CS 1	Relationship of referenced plan with respect to current plan. Defined Terms: PRIOR plan delivered prior to current Treatment ALTERNATIVE alternative plan prepared for current treatment PREDECESSOR plan used in derivation of current plan VERIFIED_PLAN plan which is verified using the current plan. This value shall only be used if Treatment Intent (300A,000A) is present and has a value of VERIFICATION. Required if Referenced RT Plan Sequence (300C,0002) is sent.	This attribute is used for maintaining the versioning relationship between plans in the syngo RT context. Note that branching version chains is technically possible using this attribute, but it is forbidden in syngo RT.			RTT-PT	Written. Only PREDECESSOR used. RT Plan Sequence then points to the predecessor plan.
Beam Display Properties	(0039, xx76)	3	CS 1	Private attribute to store beam number, beam color and beam group in the following format:	This attribute is deprecated and shall not be written any more!				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				BeamDisplayInfo ('#' BeamDisplayInfo)* BeamDisplayInfo = BeamNumber ',' BeamColor ',' BeamGroup BeamNumber = [0-9]+ BeamColor = [0-9]+ BeamGroup = [A-Za-z_0-9]+ Beam color is stored as Microsoft C++ COLORREF. Beams are grouped having common isocenter.					
Dose Calculation and Optimization Parameters	(300B, xxD6)	3	UT 1	XML string containing dose calculation and optimization parameters.			Used	RTT-PT	Not used
Base Data Group Sequence	(300B, xxE0)	3	SQ 1	Introduces the sequence of base data group identifiers referencing the base data used in the calculation of this plan. Only a single item shall be permitted in this sequence.	The identifiers are the primary keys of the respective data base entries in ConfigDataSC. Identifiers are strings with a maximum length of 16 characters.		Used	RTT-PT	Not used
> Physics Base Data Group ID	(300B, xxE1)	1	CS 1	Identifier of the physics base data group used in the dose calculation of this plan.				RTT-PT	Not used
> Biological Base Data Group ID	(300B, xxE2)	1	CS 1	Identifier of the biological base data group used in the dose calculation of this plan.				RTT-PT	Not used
> Imaging Base Data Group ID	(300B, xxE3)	1	CS 1	Identifier of the imaging base data group used in the dose calculation of this plan.				RTT-PT	Not used
> Dosimetric Base Data Group ID	(300B, xxE4)	1	CS 1	Identifier of the dosimetric base data group used in the dose calculation of this plan.				RTT-PT	Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Dose Optimization Constraint Sequence	(300B, xxC0)	3	SQ 1	Introduces the sequence of dose optimization constraints. One or more items may be included in this sequence.			Used	RTT-PT	Not used
> Dose Constraint Status	(300B, xxD8)	3	CS 1	Defines whether the constraint shall be taken into account during optimization. Enumerated values: ENABLED DISABLED If no value is sent, ENABLED is assumed.				RTT-PT	Not used
> Dose Reference Number	(300A, 0012)	1	IS 1	Identification number of the dose reference. The value of dose reference number shall be unique within RT plan in which it is created.				RTT-PT	Not used
> Dose Reference Structure Type	(300A, 0014)	1	CS 1	Structure type of the dose reference. Defined terms: POINT = dose reference point specified as ROI, VOLUME = dose reference volume specified as ROI, COORDINATES = point specified by dose reference point coordinates.				RTT-PT	Not used
> Dose Reference Description	(300A, 0016)	3	LO 1	User defined description of dose reference				RTT-PT	Not used
> Referenced ROI Number	(3006, 0084)	1C	IS 1	Uniquely identifies ROI representing the reference specified by ROI Number (3006,0022) in Structure Set ROI Sequence (3006,0020) in Structure Set Module within Structure Set in Referenced Structure Set Sequence (300C,0060) in General Plan Module. Required if dose reference				RTT-PT	Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				structure type is POINT or VOLUME .					
> Dose Reference Roint Coordinates	(300A, 0018)	1C	DS 3	Coordinates (x, y, z) of Reference Point in the patient based coordinate system. Required if dose reference structure type is COORDINATES .				RTT-PT	Not used
> Nominal Prior Dose	(300A, 001A)	3	DS 1	Dose from prior treatment to this dose reference.				RTT-PT	Not used
> Dose Reference Type	(300A, 0020)	1	CS 1	Type of dose reference. Defined terms are TARGET and ORGAN_AT_RISK.				RTT-PT	Not used
> Target Maximum Dose Constraint	(300B, xxC8)	3	DS 1	Maximum dose to be applied to the target.	This field shall contain the total plan dose, not the fraction dose.			RTT-PT	Not used
> Target Maximum Dose Constraint Weight	(300B, xxC9)	3	DS 1	Constraint weight of the maximum target dose.				RTT-PT	Not used
> Target Minimum Dose Constraint	(300B, xxCA)	3	DS 1	Minimum dose to be applied to the target.	This field shall contain the total plan dose, not the fraction dose.			RTT-PT	Not used
> Target Minimum Dose Constraint Weight	(300B, xxCB)	3	DS 1	Constraint weight of the minimum target dose.				RTT-PT	Not used
> Organ At Risk Maximum Dose Constraint	(300B, xxCC)	3	DS 1	Maximum dose to be applied to an organ at risk.	In principle, this could be combined with the constraint on the target, but this way, the structure of the prescription module is copied. This field shall contain the total plan dose, not the fraction dose.			RTT-PT	Not used
> Organ At Risk Maximum Dose	(300B, xxCD)	3	DS 1	Constraint weight of the				RTT-PT	Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Constraint Weight				maximum organ at risk dose.					
> Organ At Risk Minimum Dose Constraint	(300B, xxD9)	3	DS 1	Minimum dose to be applied to an organ at risk.	The setting of minmum doses for OARs might seem nonsensical at first sight, but is actually used by the planner to drive the optimization process into a certain direction. This field shall contain the total plan dose, not the fraction dose.			RTT-PT	Not used
> Organ At Risk Minimum Dose Constraint Weight	(300B, xxDA)	3	DS 1	Constraint weight of the minimum organ at risk dose.				RTT-PT	Not used
> DVH Constraint Sequence	(300B, xxCE)	3	SQ 1	Introduces a sequence of DVH constraints. One or more items may be included in this sequence				RTT-PT	Not used
>> DVH Constraint Volume Limit	(300B, xxCF)	1	DS 1	Volume value of the DVH constraint.					
>> DVH Constraint Volume Units	(300B, xxD0)	1	CS 1	Volume axis units. Defined terms 'CM3' (cubic centimeters) and PERCENT. As of now, this tag shall always have the value 'PERCENT'.					
>> DVH Constraint Dose Limit	(300B, xxD1)	1	DS 1	Dose value of the DVH constraint.	Dose values are always in absolute units and are given in Gy or GyE, depending on the "Dose Type" (3004,0004) in the RT Prescription Module. This field shall contain the total plan dose, not the fraction dose.				
>> DVH	(300B,	1	CS 1	Specifies					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Constraint Direction	xxD3)			whether the constraint corresponds to an upper or lower constraint for the DVH curve. Enumerated values: UPPER (curve shall pass below the point) and LOWER (curve shall pass above the point).					
>> DVH Constraint Weight	(300B, xxD4)	1	DS 1	Weigthing of the DVH constraint.					
Applied Renormalization Factor	(300B, xxD7)	3	DS 1	Renormalization factor which has been applied to all ion counts for each beam and all dose distributions attached to this plan. If no value is sent, then a default of 1 can be assumed.		1.0	Used	RTT-PT	Not used
Patient Barcode	(300B, xx30)	3	LO 1	Patient Barcode ID.	This attribute is a workaround because RTT-PT has the requirement to enter a patient ID during plan enrichment and to compare against it during subsequent treatment sessions. For local applications, it is not allowed to modify the patient module (=patient reconciliation), which would be the correct way to do it. This attribute shall only be used until syngo.NET allows to perform a patient reconciliation and synchronize it with the			RTT-PT	Written

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
					background IT systems.				
Configuration Baseline	(300B, xxE5)	3	OB 1	Contains the configuration baseline the plan was generated with.	This attribute is evalutated in TxSD only. The Plan interface by TxSD will provide convenience methods only, that specify the validity of the baseline.		Used	RTT-PT	Read
Configuration Objects	(300B, xxE6)	3	OB 1	Contains the configuration objects referenced through ID in the plan in serialized form.	The content of this attribute is deserialized into ConfigData objects in case the plan is outdated and not compatible but has to be displayed correctly.	Not used	Not used	RTT-PT	Not used

8.8.22 RT General Treatment Record Mod

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
Instance Number	(0020,0013)	1	IS 1	Instance number identifying this particular instance of the object.			RTT-PT	Treatment Summary Record IOD: Written RT Ion Beams Treatment Record IOD: Written
Treatment Date	(3008,0250)	2	DA 1	Date when current fraction was delivered, or Date last fraction was delivered in case of RT Treatment Summary Record IOD.			RTT-PT	Treatment Summary Record IOD: Written RT Ion Beams Treatment Record IOD: Written
Treatment Time	(3008,0251)	2	TM 1	Time when current fraction was delivered (begun), or Time last fraction was delivered (begun) in case of RT Treatment Summary Record IOD.			RTT-PT	Treatment Summary Record IOD: Written RT Ion Beams Treatment Record IOD: Written
Dose Type	(3004,0004)	3	CS 1	Type of dose. Defined Terms: PHYSICAL = physical dose (Absorbed dose) EFFECTIVE =	ERROR is unused here	Used	RTT-PT	Treatment Summary Record IOD: Written. Always “EFFECTIVE”. RT Ion Beams

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				physical dose after correction for biological effect using userdefined modeling technique ERROR = difference between desired and planned dose.				Treatment Record IOD: Written. Always “EFFECTIVE”.
Referenced RT Plan Sequence	(300C,0002)	2	SQ 1	A sequence that provides reference to a RT Plan SOP Class/Instance pair. Only a single Item shall be permitted in this Sequence.		Used	RTT-PT	Treatment Summary Record IOD: Modified RT Ion Beams Treatment Record IOD: Modified
>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced RT Plan Sequence (300C,0002) is sent.			RTT-PT	Treatment Summary Record IOD: Written RT Ion Beams Treatment Record IOD: Written
>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced RT Plan Sequence (300C,0002) is sent.			RTT-PT	Treatment Summary Record IOD: Written RT Ion Beams Treatment Record IOD: Written
Referenced Treatment Record Sequence	(3008,0030)	3	SQ 1	A sequence that provides reference to RT Treatment Record SOP Class/Instance pairs to which the current RT Treatment Record is significantly related. The sequence may contain one or more items.			RTT-PT	Treatment Summary Record IOD: Written. This sequence will contain all the beam session records for this entire treatment.
>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced Treatment Record Sequence (3008,0030) is sent.			RTT-PT	Treatment Summary Record IOD: Written RT Ion Beams Treatment Record IOD: Written
>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced Treatment Record Sequence (3008,0030) is sent.			RTT-PT	Treatment Summary Record IOD: Written RT Ion Beams Treatment Record IOD: Written
Checksum Encryption Code	(300B,xxA1)	3	OB 1	A 128 bit encryption code generated by MD5 algorithm to verify	The details about the set of attributes to go into the		RTT-PT	Written

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				the checksum.	checksum can be found in ClearCase: \DOCS\SWDS\ArcH&Comps\WS Infrastructure			

8.8.23 RT Image Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Samples per Pixel	(0028,0002)	1	US 1	Number of samples (planes) in this image. For RT Images, Samples per Pixel (0028,0002) shall have the Enumerated Value of 0001H		RTT-PT	Read
Photometric Interpretation	(0028,0004)	1	CS 1	Specifies the intended interpretation of the pixel data. For RT Images, Photometric Interpretation (0028,0004) shall have the Enumerated Value of MONOCHROME2		RTT-PT	Read
Bits Allocated	(0028,0100)	1	US 1	Number of bits allocated for each pixel sample. For RT Images, Bits Allocated (0028,0100) shall have an Enumerated Value of 8 16 Each sample shall have the same number of bits allocated.		RTT-PT	Read
Bits Stored	(0028,0101)	1	US 1	Number of bits stored for each pixel sample. Enumerated Values: 8 12 13 14 15 16 Each sample shall have the same number of bits stored. See Bits Stored in [] for specialization.		RTT-PT	Read
High Bit	(0028,0102)	1	US 1	Most significant bit for each pixel sample. Each sample shall have the same high bit. See High Bit in [] for specialization.		RTT-PT	Read
Pixel Representation	(0028,0103)	1	US 1	Data representation of the pixel samples. For RT Images, Pixel Representation (0028,0103) shall have the Enumerated Value of 0000H unsigned integer		RTT-PT	Read

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				Each sample shall have the same pixel representation.			
RT Image Label	(3002,0002)	1	SH 1	User-defined label for RT Image.		RTT-PT	Read
RT Image Name	(3002,0003)	3	LO 1	User-defined name for RT Image.		RTT-PT	Read
RT Image Description	(3002,0004)	3	ST 1	User-defined description of RT Image.		RTT-PT	Read
Operators' Name	(0008,1070)	2	PN 1-n	Name of operator(s) acquiring or creating RT Image.		RTT-PT	Read
Image Type	(0008,0008)	1	CS 1-n	Image identification characteristics. RT Images shall use one of the following Defined Terms for Value 3: DRR digitally reconstructed radiograph PORTAL digital portal image or portal film image SIMULATOR conventional simulator image RADIOGRAPH radiographic image BLANK image pixels set to background value FLUENCE fluence map See General Image - Image Type in [] for more information.		RTT-PT	Read
Conversion Type	(0008,0064)	2	CS 1	Describes the kind of image conversion. Defined Terms: DV Digitized Video DI Digital Interface DF Digitized Film WSD Workstation		RTT-PT	Read
Reported Values Origin	(3002,000A)	2C	CS 1	Describes the origin of the parameter values reported in the image. Enumerated Values: OPERATOR manually entered by operator PLAN planned parameter values ACTUAL electronically recorded Required if Value 3 of Image Type (0008,0008) is SIMULATOR or PORTAL.			
RT Image Plane	(3002,000C)	1	CS 1	Describes whether or not image plane is normal to beam axis. Enumerated Values:		RTT-PT	Read

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				NORMAL image plane normal to beam axis NON_NORMAL image plane non-normal to beam axis			
X-Ray Image Receptor Translation	(3002,000D)	3	DS 3	Position in (x,y,z) coordinates of origin of IEC X-RAY IMAGE RECEPTOR System in the IEC GANTRY coordinate system (mm).			
X-Ray Image Receptor Angle	(3002,000E)	2	DS 1	X-Ray Image Receptor Angle i.e. orientation of IEC X-RAY IMAGE RECEPTOR coordinate system with respect to IEC GANTRY coordinate system (degrees). See X-Ray Image Receptor Angle in [].			
RT Image Orientation	(3002,0010)	2C	DS 6	The direction cosines of the first row and the first column with respect to the IEC XRAY IMAGE RECEPTOR coordinate system. Required if RT Image Plane (3002,000C) is NON_NORMAL.			
Image Plane Pixel Spacing	(3002,0011)	2	DS 2	Physical distance (in mm) between the center of each image pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing. See Image Plane Pixel Spacing and RT Image SID in [].		RTT-PT	Read
RT Image Position	(3002,0012)	2	DS 2	The x and y coordinates (in mm) of the upper left hand corner of the image, in the IEC X-RAY IMAGE RECEPTOR coordinate system. This is the center of the first pixel transmitted.			
Radiation Machine Name	(3002,0020)	2	SH 1	User-defined name identifying radiation machine used in acquiring or computing image (i.e. name of conventional simulator, electron accelerator, X-ray device, or machine modeled when calculating DRR).		RTT-PT	Read
Primary Dosimeter Unit	(300A,00B3)	2	CS 1	Measurement unit of machine dosimeter. Enumerated Values: MU Monitor Unit MINUTE minute			
Radiation	(3002,0022)	2	DS 1	Radiation source to		RTT-PT	Read

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Machine SAD				Gantry rotation axis distance of radiation machine used in acquiring or computing image (mm).			
Radiation Machine SSD	(3002,0024)	3	DS 1	Source to patient surface distance (in mm) of radiation machine used in acquiring or computing image.		RTT-PT	Read
RT Image SID	(3002,0026)	2	DS 1	Distance from radiation machine source to image plane (in mm) along radiation beam axis. See Image Plane Pixel Spacing and RT Image SID in [].		RTT-PT	Read
Source to Reference Object Distance	(3002,0028)	3	DS 1	Source to reference object distance (in mm), as used for magnification calculation of RADIOGRAPH and SIMULATOR images.			
Referenced RT Plan Sequence	(300C,0002)	3	SQ 1	Introduces sequence of one Class/Instance pair describing RT Plan associated with image. Only a single item shall be permitted in this sequence.		RTT-PT	Read
>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced RT Plan Sequence (300C,0002) is sent.		RTT-PT	Read
>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced RT Plan Sequence (300C,0002) is sent.		RTT-PT	Read
Referenced Beam Number	(300C,0006)	3	IS 1	Uniquely identifies the corresponding segment treatment beam specified by Beam Number (300A,00C0) within Beam Sequence in RT Beams Module within the RT Plan referenced in Referenced RT Plan Sequence (300C,0002).		RTT-PT	Read
Referenced Fraction Group Number	(300C,0022)	3	IS 1	Identifier of Fraction Group within RT Plan referenced in Referenced RT Plan Sequence (300C,0002).			
Fraction Number	(3002,0029)	3	IS 1	Fraction Number of fraction during which image was acquired, within Fraction Group referenced by Referenced Fraction Group Number (300C,0022) within RT Plan referenced in Referenced RT Plan			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				Sequence (300C,0002).			
Start Cumulative Meterset Weight	(300C,0008)	3	DS 1	Cumulative Meterset Weight within Beam referenced by Referenced Beam Number (300C,0006) at which image acquisition starts.			
End Cumulative Meterset Weight	(300C,0009)	3	DS 1	Cumulative Meterset Weight within Beam referenced by Referenced Beam Number (300C,0006) at which image acquisition ends.			
Fluence Map Sequence	(3002,0040)	1C	SQ 1	A Sequence of data describing the fluence map attributes for a radiotherapy beam. Only one item may be included in this sequence. Required if the third value of Image Type (0008,0008) is FLUENCE.			
>Fluence Data Source	(3002,0041)	1	CS 1	Source of fluence data. Enumerated Values: CALCULATED Calculated by a workstation MEASURED Measured by exposure to a film or detector			
>Fluence Data Scale	(3002,0042)	3	DS 1	The meterset corresponding with a fluence map cell value of 1.0 expressed in units specified by Primary Dosimeter Units (300A,00B3). This is the meterset value used for treatment, not the meterset used to expose the film as defined by Meterset Exposure (3002,0032).			
Exposure Sequence	(3002,0030)	3	SQ 1	Introduces sequence of Exposure parameter sets, corresponding to exposures used in generating the image. One or more items may be included in this sequence. See Exposure Sequence in [].			
>Referenced Frame Number	(0008,1160)	1C	IS 1-n	Identifies corresponding image frame in multi-frame image. Required if Exposure Sequence (3002,0030) is sent, there is more than one item in Exposure Sequence (3002,0030), and image is a multi-frame image.			
>KVP	(0018,0060)		DS 1	Peak kilo voltage output (kV) of X-ray generator			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				used to acquire image. Required if Value 3 of Image Type (0008,0008) is PORTAL, SIMULATOR or RADIOGRAPH and Exposure Sequence (3002,0030) is sent.			
>X-Ray Tube Current	(0018,1151)		IS 1	Imaging device X-ray Tube Current (mA). Required if Value 3 of Image Type (0008,0008) is SIMULATOR or RADIOGRAPH and Exposure Sequence (3002,0030) is sent.			
>Exposure Time	(0018,1150)		IS 1	Time of X-ray exposure (msec). Required if Value 3 of Image Type (0008,0008) is SIMULATOR or RADIOGRAPH and Exposure Sequence (3002,0030) is sent.			
>Meterset Exposure	(3002,0032)		DS 1	Treatment machine Meterset duration over which image has been acquired, specified in Monitor units (MU) or minutes as defined by Primary Dosimeter Unit (300A,00B3). Required if Value 3 of Image Type (0008,0008) is PORTAL and Exposure Sequence (3002,0030) is sent.			
>Diaphragm Position	(3002,0034)	3	DS 4	Positions of diaphragm jaw pairs (in mm) in IEC BEAM LIMITING DEVICE coordinate axis in the IEC order X1, X2, Y1, Y2.			
>Beam Limiting Device Sequence	(300A,00B6)	3	SQ 1	Introduces sequence of beam limiting device (collimator) jaw or leaf (element) positions for given exposure. One or more items may be included in this sequence.			
>>RT Beam Limiting Device Type	(300A,00B8)	1C	CS 1	Type of beam limiting device (collimator). Enumerated Values: X symmetric jaw pair in IEC X direction Y symmetric jaw pair in IEC Y direction ASYMX asymmetric jaw pair in IEC X direction ASYMY asymmetric pair in IEC Y direction MLCX multileaf (multi-element)			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				jaw pair in IEC X direction MLCY multileaf (multi-element) jaw pair in IEC Y direction Required if Beam Limiting Device Sequence (300A,00B6) is sent.			
>>Source to Beam Limiting Device Distance	(300A,00BA)	3	DS 1	Radiation source to beam limiting device (collimator) distance (mm).			
>>Number of Leaf/Jaw Pairs	(300A,00BC)	1C	IS 1	Number of leaf (element) or jaw pairs (equal to 1 for standard beam limiting device jaws).XRequired if Beam Limiting Device Sequence (300A,00B6) is sent.			
>>Leaf Position Boundaries	(300A,00BE)	2C	DS 3-n	Boundaries (in mm) of beam limiting device (collimator) leaves (elements) in IEC BEAM LIMITING DEVICE coordinate axis appropriate to RT Beam Limiting Device Type (300A,00B8), for example X-axis for MLCY, Y-axis for MLCX. Contains N+ 1 values, where N is the Number of Leaf/Jaw Pairs (300A,00BC), starting from Leaf (Element) Pair 1. Required if RT Beam Limiting Device Type (300A,00B8) is MLCX or MLCY.			
>>Leaf/Jaw Positions	(300A,011C)	1C	DS 2-2n	Positions of beam limiting device (collimator) leaf or jaw (element) pairs (in mm) in IEC BEAM LIMITING DEVICE coordinate axis appropriate to RT Beam Limiting Device Type (300A,00B8), for example X-axis for MLCX, Y-axis for MLCY). Contains 2N values, where N is the Number of Leaf/Jaw Pairs (300A,00BC), in IEC leaf (element) subscript order 101, 102, to 1N, 201, 202, to 2N. Required if Beam Limiting Device Sequence (300A,00B6) is sent.			
>Applicator Sequence	(300A,0107)	3	SQ 1	Introduces sequence of Applicators associated with Beam. Only a single item shall be permitted in this			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				sequence.			
>>Applicator ID	(300A,0108)	1C	SH 1	User or machine supplied identifier for Applicator. Required if Applicator Sequence (300A,0107) is sent.			
>>Applicator Type	(300A,0109)	1C	CS 1	Type of Applicator. Defined Terms: ELECTRON_SQUARE square electron applicator ELECTRON_RECT rectangular electron applicator ELECTRON_CIRC circular electron applicator ELECTRON_SHORT short electron applicator ELECTRON_OPEN open (dummy) electron applicator INTRAOPERATIVE intraoperative (custom) applicator STEREOTACTIC stereotactic applicator Required if Applicator Sequence (300A,0107) is sent.			
>>Applicator Description	(300A,010A)	3	LO 1	User-defined description for Applicator.			
>Number of Blocks	(300A,00F0)	1C	IS 1	Number of shielding blocks associated with Beam. Required if Exposure Sequence (3002,0030) is sent.			
>Block Sequence	(300A,00F4)	2C	SQ 1	Introduces sequence of blocks associated with Beam. Required if Number of Blocks (300A,00F0) is non-zero. One or more items may be included in this sequence.			
>>Block Tray ID	(300A,00F5)	3	SH 1	User-supplied identifier for block tray.			
>>Source to Block Tray Distance	(300A,00F6)	2C	DS 1	Radiation Source to attachment edge of block tray assembly (mm). Required if Block Sequence (300A,00F4) is sent.			
>>Block Type	(300A,00F8)	1C	CS 1	Type of block. Enumerated Values: SHIELDING blocking material is inside contour APERTURE blocking material is outside contour Required if Block Sequence (300A,00F4) is sent.			
>>Block	(300A,00FA)	2C	CS 1	Indicates presence or			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Divergence				otherwise of geometrical divergence. Enumerated Values: PRESENT block edges are shaped for beam divergence ABSENT block edges are not shaped for beam divergence Required if Block Sequence (300A,00F4) is sent.			
>>Block Mounting Position	(300A,00FB)	3	CS 1	Indicates on which side of the Block Tray the block is mounted. Enumerated Values: PATIENT_SIDE The block is mounted on the side of the Block Tray which is towards the patient. SOURCE_SIDE The block is mounted on the side of the Block Tray which is towards the radiation source.			
>>Block Number	(300A,00FC)	1C	IS 1	Identification Number of the Block. The value of Block Number (300A,00FC) shall be unique within the Beam in which it is created. Required if Block Sequence (300A,00F4) is sent.			
>>Block Name	(300A,00FE)	3	LO 1	User-defined name for block.			
>>Material ID	(300A,00E1)	2C	SH 1	User-supplied identifier for material used to manufacture Block. Required if Block Sequence (300A,00F4) is sent.			
>>Block Thickness	(300A,0100)	3	DS 1	Physical thickness of block (in mm) parallel to radiation beam axis.			
>>Block Number of Points	(300A,0104)	2C	IS 1	Number of (x, y) pairs defining the block edge. Required if Block Sequence (300A,00F4) is sent.			
>>Block Data	(300A,0106)	2C	DS 2-2n	A data stream of (x, y) pairs which comprise the block edge. The number of pairs shall be equal to Block Number of Points (300A,0104), and the vertices shall be interpreted as a closed polygon. Coordinates are projected onto the machine isocentric plane in the IEC BEAM LIMITING DEVICE coordinate system (mm). Required if Block			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				Sequence (300A,00F4) is sent.			
Gantry Angle	(300A,011E)	3	DS 1	Treatment machine gantry angle, i.e. orientation of IEC GANTRY coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees).	The Gantry Angle corresponds to the angle phi of the Gantry System as described in the ER Coordinate Systems.	RTT-PT	Read
Beam Limiting Device Angle	(300A,0120)	3	DS 1	Treatment machine beam limiting device (collimator) angle, for example orientation of IEC BEAM LIMITING DEVICE coordinate system with respect to IEC GANTRY coordinate system (degrees).			
Patient Support Angle	(300A,0122)	3	DS 1	Patient Support angle, or table isocentric angle i.e. orientation of IEC PATIENT SUPPORT coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees).	The Patient Support Angle corresponds to the isocentric rotation angle theta as defined for the Patient support system or the table top system, direct in the ER Coordinate Systems.	RTT-PT	Read
Table Top Eccentric Axis Distance	(300A,0124)	3	DS 1	Distance (positive) from the IEC PATIENT SUPPORT vertical axis to the IEC TABLE TOP ECCENTRIC vertical axis (mm).			
Table Top Eccentric Angle	(300A,0125)	3	DS 1	Table Top (non-isocentric) angle, for example orientation of IEC TABLE TOP ECCENTRIC coordinate system with respect to IEC PATIENT SUPPORT system (degrees).			
Table Top Vertical Position	(300A,0128)	3	DS 1	Table Top Vertical position in IEC TABLE TOP coordinate system (mm).	The Table Top Vertical Position corresponds to the displacement delta_z of the Table Top System, direct (cf. ER Coordinate Systems)	RTT-PT	Read
Table Top Longitudinal Position	(300A,0129)	3	DS 1	Table Top Longitudinal position in IEC TABLE TOP coordinate system (mm).	The Table Top Longitudinal Position corresponds to the displacement delta_y of the Table Top System, direct (cf. ER Coordinate Systems)	RTT-PT	Read
Table Top Lateral Position	(300A,012A)	3	DS 1	Table Top Lateral position in IEC TABLE TOP coordinate system (mm).	The Table Top Lateral Position corresponds to the displacement delta_x of the Table Top System, direct (cf. ER Coordinate Systems)	RTT-PT	Read
Table Top Pitch Angle	(300A,0140)	3	FL 1	The Patient Support Pitch Angle, i.e. orientation of PITCHED PATIENT SUPPORT	The Patient Support Pitch Angle corresponds to the angle psi of the	RTT-PT	Read

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				coordinate system with respect to IEC PATIENT SUPPORT coordinate system (degrees). Pitching is the rotation around IEC PATIENT SUPPORT X-axis. Required for first item of Control Point Sequence, or if Patient Support Pitch Angle changes during Beam.	Pitched patient support system as described in the ER Coordinate Systems.		
Table Top Roll Angle	(300A,0144)	3	FL 1	Patient Support Roll Angle, i.e. orientation of ROLLED PATIENT SUPPORT coordinate system with respect to PITCHED PATIENT SUPPORT coordinate system (degrees). Rolling is the rotation around PITCHED PATIENT SUPPORT Y-axis. Required for first item of Control Point Sequence, or if Patient Support Roll Angle changes during Beam.	The Patient Support Roll Angle corresponds to the angle phi of the Rolled patient support system as described in the ER Coordinate Systems.	RTT-PT	Read
Imager Angular Angle	(300B,xx24)	3	DS 1	Angle describing the rotation of the OFF-PLANE coordinate system around the positive X-Axis direction of the imager center coordinate system. A positive angle corresponds to a clockwise rotation as viewed in the direction of the X-Axis.	The Imager Angular Angle corresponds to the angle psi of the Imager rotation system as described in the ER Coordinate Systems.	RTT-PT	Read
Imager Angular Rotation Direction	(300B,xx29)	3	CS 1	Direction of imager angular rotation. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation	TPS uses only right-handed coordinate systems and -rotations. A positive angle value thus always means clock-wise rotation.CW rotation.		
Imager Iso-centric Angle	(300B,xx25)	3	DS 1	Angle describing the rotation of the imager center coordinate system with respect to the IEC Fixed coordinate system (degrees). Required for first item of Control Point Sequence, or if the Isocentric Angle changes during the imager beam.	The Imager Iso-centric Angle corresponds to the angle theta of the Imager center system as described in the ER Coordinate Systems.	RTT-PT	Read
Imager Isocentric Rotation Direction	(300B,xx2A)	3	CS 1	Direction of imager isocentric rotation. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation	Always CW in our case.	RTT-PT	Consistency checked. Tx Beams and Motion Beams: Not used Imaging Beams: Read. Only present in CP0. Not present in other CPs.

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Imager Orbital Angle	(300B,xx2C)	3	DS 1	Angle describing the rotation of the imager coordinate system with respect to the imager rotation system in degrees.	The Imager Orbital Angle corresponds to the angle phi of the Imager system as described in the ER Coordinate Systems. For a robot based system, this angle describes the rotation of the C-arm around the patient.	RTT-PT	Read
Imager Orbital Rotation Direction	(300B,xx2F)	3	CS 1	Direction of imager orbital rotation. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation	Always CW in our case.		
Imager Vertical Position	(300B,xx26)	3	DS 1	Robot Imager Vertical position in coordinate system (mm).	The Imager Vertical Position corresponds to the displacement in delta_z of the Imager center system (cf. ER Coordinate Systems)		
Imager Longitudinal Position	(300B,xx27)	3	DS 1	Robot Imager Longitudinal position in coordinate system (mm).	The Imager Longitudinal Position corresponds to the displacement delta_y of the Imager center system (cf. ER Coordinate Systems)		
Imager Lateral Position	(300B,xx28)	3	DS 1	Robot Imager Lateral position in coordinate system (mm).	The Imager Lateral Position corresponds to the displacement delta_x of the Imager center system (cf. ER Coordinate Systems).		
Isocenter Position	(300A,012C)	3	DS 3	Isocenter coordinates (x,y,z), in mm. Specifies the location of the machine isocenter in the patient-based coordinate system associated with the Frame of Reference. It allows transformation from the equipment-based IEC coordinate system to the patient-based coordinate system.			
Patient Position	(0018,5100)	1C	CS 1	Patient position descriptor relative to the patient support device. Required if Isocenter Position (300A,012C) is present. May be present otherwise. See Section PS 3.3 C.8.8.12.1.2 for Defined Terms and further explanation. Note: The orientation of the patient relative to the patient support device is denoted in the same			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				manner as in the RT Patient Setup module. It defines the relation of the patient-based DICOM coordinate system identified by the frame of reference module of the RT Image to the IEC coordinate system and together with the Isocenter Position (300A,012C) allows the RT Image to be placed into the patient frame of reference. It also allows a system using an RT Image to verify that the patient is setup in a similar position relative to the patient support device.			

8.8.24 RT Ion Beams Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Private Extensions for this module can be found in "RT General Plan::External Attributes"									
Ion Beam Sequence	(300A, 03A2)	1	SQ 1	Introduces sequence of setup and/or treatment beams for current RT Ion Plan. One or more items may be included in this sequence.			Used if it is a Tx Beam	RTT-PT	Read
>Beam Number	(300A, 00C0)	1	IS 1	Identification number of the Beam. The value of Beam Number (300A,00C0) shall be unique within the RT Ion Plan in which it is created. See note below.				RTT-PT	Read
>Beam Name	(300A, 00C2)	1	LO 1	User-defined name for Beam.				RTT-PT	Read
>Beam Description	(300A, 00C3)	3	ST 1	User-defined description for Beam.				RTT-PT	Treatment Beams: Read Imaging Beams: Read Motion Beams: Written
>Beam Type	(300A, 00C4)	1	CS 1	Motion characteristic of Beam. Enumerated					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				Values: STATIC all beam parameters remain unchanged during delivery DYNAMIC one or more beam parameters changes during delivery					
>Referenced Beam Number	(300C, 0006)	3	IS 1	Uniquely identifies the corresponding treatment beam specified by Beam Number (300A,00C0) within Beam Sequence in RT (Ion) Beams Module within the RT (Ion) Plan referenced in Referenced RT Plan Sequence (300C,0002).					
>Radiation Type	(300A, 00C6)	1	CS 1	Particle type of Beam. Defined Terms: PHOTON PROTON ION				RTT-PT	Tx Beams: ION or PROTON Imaging Beams and Motion Beams: PHOTON
>Radiation Mass Number	(300A, 0302)	1C	IS 1	Mass number of radiation. Required if Radiation Type (300A,00C6) is ION		Carbon: 12, Proton: not required		RTT-PT	Tx Beams: Read Imaging Beams and Motion Beams: Not used (Empty)
>Radiation Atomic Number	(300A, 0304)	1C	IS 1	Atomic number of radiation. Required if Radiation Type (300A,00C6) is ION		Carbon: 6, Proton: not required		RTT-PT	Tx Beams: Read Imaging Beams and Motion Beams: Not used (Empty)
>Radiation Charge State	(300A, 0306)	1C	SS 1	Charge state of radiation. Required if Radiation Type (300A,00C6) is ION		Carbon: 6 (or +6), Proton: not required		RTT-PT	Tx Beams: Read Imaging Beams and Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
									(Empty)
>Scan Mode	(300A, 0308)	1	CS 1	The method of beam scanning to be used during treatment. Defined Terms: NONE = No beam scanning is performed. UNIFORM = The beam is scanned between control points to create a uniform lateral fluence distribution across the field. MODULATED = The beam is scanned between control points to create a modulated lateral fluence distribution across the field.				RTT-PT	Tx Beams: MODULATED Imaging Beams and Motion Beams: NONE
>Treatment Machine Name	(300A, 00B2)	2	SH 1	User-defined name identifying treatment machine to be used for beam delivery.	In Ion context, the Treatment Machine Name denotes the BAMS (=beamline). It is possible to have more than one beamline in a treatment room, so it does not make sense to refer to the room here. At least in PT1.0, it shall not be possible to have plans with beamlines in different rooms. The name here is the name of an Irradiation-Device instance (IrradiationDevice.Name) in Admin&Config. The IrradiationDevice.Type is expected to be BeamLineType. TxSessionData.NET provides a method to directly navigate from the Beam to the IrradiationDevice instance in Admin&Config without explicitely going through the name.	ROOM1		RTT-PT	Read
>Alternative Treatment	(300B,	3	SQ 1	Introduces sequence of				RTT-	Read

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Machine Name Sequence	xx20)			treatment machines (treatment room) that may be used for treatment of the patient. One or more items may be included in this sequence.				PT	
>>Treatment Machine Name	(300A, 00B2)	2	SH 1	User-defined name identifying alternative treatment machine to be used for beam delivery.	please see comment for Treatment Machine Name above.	ROOM2		RTT-PT	Read
>Manufacturer	(0008, 0070)	3	LO 1	Manufacturer of the equipment to be used for beam delivery.				RTT-PT	Tx Beams: Used to populate the same information into RT Beams Tx Record and RT Tx Summary Record Imaging Beams and Motion Beams: Read
>Institution Name	(0008, 0080)	3	LO 1	Institution where the equipment is located that is to be used for beam delivery.				RTT-PT	Tx Beams: Used to populate the same information into RT Beams Tx Record and RT Tx Summary Record Imaging Beams and Motion Beams: Read
>Institution Address	(0008, 0081)	3	ST 1	Mailing address of the institution where the equipment is located that is to be used for beam delivery.				RTT-PT	Tx Beams: Used to populate the same information into RT Beams

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
									Tx Record and RT Tx Summary Record Imaging Beams and Motion Beams: Read
>Institutional Department Name	(0008, 1040)	3	LO 1	Department in the institution where the equipment is located that is to be used for beam delivery.				RTT-PT	Tx Beams: Used to populate the same information into RT Beams Tx Record and RT Tx Summary Record Imaging Beams and Motion Beams: Read
>Manufacturer's Model Name	(0008, 1090)	3	LO 1	Manufacturer's model name of the equipment that is to be used for beam delivery.				RTT-PT	Tx Beams: Used to populate the same information into RT Beams Tx Record and RT Tx Summary Record Imaging Beams and Motion Beams: Read
>Device Serial Number	(0018, 1000)	3	LO 1	Manufacturer's serial number of the equipment that is to be used for beam delivery.				RTT-PT	Tx Beams: Used to populate the same information into RT Beams Tx Record

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
									and RT Tx Summary Record Imaging Beams and Motion Beams: Read
>Imager Organ Program	(300B, xx12)	3	LO 1	Private attribute storing the organ program used to acquire the image at the AX system				RTT-PT	Tx Beams and Motion Beams: Not used Imaging Beams: Read (displayed!)
>XA Image SID	(300B, xx13)	3	DS 1	AX machine source to image plane distance (mm).				RTT-PT	Tx Beams and Motion Beams: Not used Imaging Beams: Read
>XA Image Receptor Angle	(300B, xx14)	3	DS 1	AX machine Image Receptor Angle i.e. the rotation angle of the image detector system around the z-axis relative to the supporting device in degrees.	The angle describes the rotation of the image detector around an axis perpendicular to the detector surface. In robot based imager systems this angle is not absolutely required as the respective degree of freedom is already covered by the motion variables of the robot. However, it would simplify things, if required. It thus has been decided to nevertheless keep this tag for future use and always have it set to '0' for now. See the ER Coordinate Systems for the definition of the 'image detector system'. For LINAC based installations, this			RTT-PT	Tx Beams and Motion Beams: Not used Imaging Beams: Read

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
					system can be considered equivalent to the IEC X-Ray image receptor system.				
>Primary Dosimeter Unit	(300A, 00B3)	1	CS 1	Measurement unit of machine dosimeter. Enumerated Values: MU Monitor Unit MAMPSEC MilliAmp Seconds NP number of particles				RTT-PT	Tx Beams: Read (Must be NP) Imaging Beams and Motion Beams: MU
>Referenced Tolerance Table Number	(300C, 00A0)	3	IS 1	Uniquely identifies Tolerance Table specified by Tolerance Table Number (300A,0042) within Tolerance Table Sequence in RT Ion Tolerance Tables Module. These tolerances are to be used for verification of treatment machine settings.				RTT-PT	Tx Beams and Imaging Beams: Read. Identifies the global tolerance table that is used. Motion Beams: Not used
>Virtual Source-Axis Distances	(300A, 030A)	1	FL 2	Distance (in mm) from virtual source position to gantry rotation axis or nominal isocenter position (fixed beam-lines) of the equipment to be used for beam delivery. Specified by a numeric pair - the VSAD in the IEC Gantry X direction (delimiter) the VSAD in the IEC Gantry Y direction. The VSAD is commonly used for designing apertures in contrast to the effective source-axis-distance (ESAD) that is commonly used with the inverse square law for calculating the dose decrease with distance. See section PS 3.3 C.8.8.25.4.	Known as the beamsource-isocenter distance in the model of terms.	typical values could be 780cm in X and 820cm in Y		RTT-PT	Tx Beams and Imaging Beams: Read Motion Beams: Written
>Ion Beam Limiting Device	(300A, 03A4)	3	SQ 1	Introduces sequence of beam limiting device					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Sequence				(collimator) jaw or leaf (element) sets. One or more items may be included in this sequence.					
>>RT Beam Limiting Device Type	(300A, 00B8)	1	CS 1	Type of beam limiting device (collimator). Enumerated Values: X symmetric jaw pair in IEC X direction Y symmetric jaw pair in IEC Y direction ASYMX asymmetric jaw pair in IEC X direction ASYMY asymmetric pair in IEC Y direction MLCX multileaf (multi-element) jaw pair in IEC X direction MLCY multileaf (multi-element) jaw pair in IEC Y direction					
>>Isocenter to Beam Limiting Device Distance	(300A, 00BB)	2	FL 1	Isocenter to beam limiting device (collimator) distance (in mm) of the equipment that is to be used for beam delivery. See section PS 3.3 C.8.8.25.4.					
>>Number of Leaf/Jaw Pairs	(300A, 00BC)	1	IS 1	Number of leaf (element) or jaw pairs (equal to 1 for standard beam limiting device jaws).					
>>Leaf Position Boundaries	(300A, 00BE)	1C	DS 3-n	Boundaries of beam limiting device (collimator) leaves (in mm) in IEC BEAM LIMITING DEVICE coordinate axis appropriate to RT Beam Limiting Device Type (300A,00B8), i.e. X-axis for MLCY, Y-axis for MLCX. Contains N+1 values, where N is the Number of Leaf/Jaw Pairs (300A,00BC), starting from Leaf (Element) Pair 1. Required if RT Beam Limiting Device Type (300A,00B8) is					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				MLCX or MLCY. See section PS 3.3 C.8.8.25.3.					
>Referenced Patient Setup Number	(300C, 006A)	3	IS 1	Uniquely identifies Patient Setup to be used for current beam, specified by Patient Setup Number (300A,0182) within Patient Setup Sequence of RT Patient Setup Module.				RTT-PT	Read.
>Referenced Reference Image Sequence	(300C, 0042)	3	SQ 1	Introduces sequence of reference images used for validation of current beam. One or more items may be included in this sequence.				RTT-PT	Tx Beams and Motion Beams: Not used Imaging Beams: Read. Used to identify the reference image. Only one image supported.
>>Referenced SOP Class UID	(0008, 1150)	1	UI 1	Uniquely identifies the referenced SOP Class.				RTT-PT	Tx Beams and Motion Beams: Not used Imaging Beams: Read
>>Referenced SOP Instance UID	(0008, 1155)	1	UI 1	Uniquely identifies the referenced SOP Instance.				RTT-PT	Tx Beams and Motion Beams: Not used Imaging Beams: Modified
>>Reference Image Number	(300A, 00C8)	1	IS 1	Uniquely identifies Reference Image within Referenced Reference Image Sequence (300C,0042).				RTT-PT	Tx Beams and Motion Beams: Not used Imaging Beams: Read
>Treatment Delivery Type	(300A, 00CE)	1	CS 1	Delivery Type of treatment. Defined Terms: TREATMENT normal patient		TREATMENT		RTT-PT	Tx Beams: TREATMENT Imaging

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				treatment OPEN_PORTFILM portal image acquisition with open field (the source of radiation is specified by Radiation Type (300A, 00C6)) TRMT_PORTFILM portal image acquisition with treatment port (the source of radiation is specified by Radiation Type (300A, 00C6)) CONTINUATION continuation of interrupted treatment SETUP no treatment beam is applied for this RT Beam. To be used for specifying the gantry, couch, and other machine positions where X-ray set-up images or measurements shall be taken. XA_IMAGING a beam to acquire a XA image.					Beams: XA_IMAGING Pickup, Dropoff and Parkimager Beams : SETUP
>Setup Type	(300B, xxA2)	3	CS 1	This attribute provides a detailled information which kind of setup is denoted when Treatment Delivery Type (300A,00CE) is SETUP. Defined Terms: PICKUP a beam that used for picking up patient to the proper treatment/imaging position DROPOFF a beam that used to drop off patient from the treatment/imaging position. PARKIMAGER a beam to park imager				RTT-PT	Written
>Imaging Technique	(300B, xx2E)	3	CS 1	Imaging Technique to be used for Position Verification. Defined Terms: DBL XRAY C_ARM DBL XRAY GANTRY				RTT-PT	Consistency checked. Imaging Beams : Read. Tx Beams

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				CBCT C_ARM CBCT GANTRY VOLUME CT					and Motion Beams: Not used.
>Requested Scanning Spot Size	(300B, xx2B)	3	DS 1	The beam diameter (FWHM) in mm as requested by the user. The actual size of the beam depends on machine capabilities and is stored separately for each control point in attribute 'Scanning Spot Size' (300A,0398).					
>Referenced Dose Sequence	(300C, 0080)	3	SQ 1	Introduces sequence of related SOP Class/Instance pairs describing related instances of RT Dose (for grids, isodose curves, and named/unnamed point doses). One or more items may be included in this sequence.	Note that an RT Dose instance referenced here is not required to refer to this beam in this plan. The RT Dose instance could also refer to the same beam in a predecessor version of this plan.				
>>Referenced SOP Class UID	(0008, 1150)	1	UI 1	Uniquely identifies the referenced SOP Class.					
>>Referenced SOP Instance UID	(0008, 1155)	1	UI 1	Uniquely identifies the referenced SOP Instance.					
>Number of Wedges	(300A, 00D0)	1	IS 1	Number of wedges associated with current beam.				RTT-PT	Not used
>Total Wedge Tray Water-Equivalent Thickness	(300A, 00D7)	3	FL 1	Shift of the wedge tray induced on the range of the ion beam as measured in water (in mm).					
>Ion Wedge Sequence	(300A, 03AA)	1C	SQ 1	Introduces sequence of treatment wedges. Required if Number of Wedges (300A,00D0) is non-zero. The number of items shall be identical to the value of Number of Wedges (300A,00D0).					
>>Wedge Number	(300A, 00D2)	1	IS 1	Identification number of the Wedges. The value of Wedge Number (300A,00D2) shall be unique within					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				the Beam in which it was created.					
>>Wedge Type	(300A, 00D3)	2	CS 1	Type of wedge (if any) defined for Beam. Defined Terms: STANDARD standard (static) wedge MOTORIZED single wedge which can be removed from beam remotely. PARTIAL_STANDARD wedge does not extend across the whole field and is operated manually. PARTIAL_MOTORIZ wedge does not extend across the whole field and can be removed from beam remotely.					
>>Wedge ID	(300A, 00D4)	3	SH 1	User-supplied identifier for Wedge.					
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.					
>>Wedge Angle	(300A, 00D5)	2	IS 1	Nominal wedge angle (degrees).					
>>Wedge Orientation	(300A, 00D8)	2	DS 1	Orientation of wedge, i.e. orientation of IEC WEDGE FILTER coordinate system with respect to the IEC BEAM LIMITING DEVICE coordinate systems (degrees).					
>>Isocenter to Wedge Tray Distance	(300A, 00D9)	1	FL 1	Isocenter to downstream edge of wedge tray (mm). See section PS 3.3 C.8.8.25.4					
>Number of Compensators	(300A, 00E0)	1	IS 1	Number of compensators associated with current Beam.				RTT-PT	Not used
>Total Compensator Tray Water-Equivalent Thickness	(300A, 02E3)	3	FL 1	Water-Equivalent thickness of the compensator tray (in mm) parallel to radiation beam axis.					
>Ion Range Compensator Sequence	(300A, 02EA)	1C	SQ 1	Introduces sequence of compensators. Required if					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				Number of Compensators (300A,00E0) is non-zero. The number of items shall be identical to the value of Number of Compensators (300A,00E0).					
>>Compensator Number	(300A, 00E4)	1	IS 1	Identification number of the Compensator. The value of Compensator Number (300A,00E4) shall be unique within the Beam in which it is created.					
>>Material ID	(300A, 00E1)	2	SH 1	User-supplied identifier for material used to manufacture Compensator.					
>>Compensator ID	(300A, 00E5)	3	SH 1	User-supplied identifier for the compensator.					
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.					
>>Isocenter to Compensator Tray Distance	(300A, 02E4)	1C	FL 1	Isocenter to compensator tray attachment edge distance (in mm) for current range compensator. Required if Compensator Mounting Position (300A,02E1) is not DOUBLE_SIDED. See section PS 3.3 C.8.8.25.4					
>>Compensator Divergence	(300A, 02E0)	1	CS 1	Indicates presence or absence of geometrical divergence of the range compensator. Enumerated Values: PRESENT the range compensator is shaped according to the beam geometrical divergence. ABSENT the range compensator is not shaped according to the beam geometrical divergence.					
>>Compensat	(300A,	1	CS 1	Indicates on which					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
or Mounting Position	02E1)			side of the Compensator Tray the compensator is mounted. Enumerated Values: PATIENT_SIDE the Compensator is mounted on the side of the Compensator Tray which is towards the patient. SOURCE_SIDE the Compensator is mounted on the side of the Compensator Tray which is towards the radiation source. DOUBLE_SIDED the Compensator has a shaped (i.e. non-flat) surface on both sides of the Compensator Tray.					
>>Compensator Rows	(300A, 00E7)	1	IS 1	Number of rows in the range compensator.					
>>Compensator Columns	(300A, 00E8)	1	IS 1	Number of columns in the range compensator.					
>>Compensator Pixel Spacing	(300A, 00E9)	1	DS 2	Physical distance (in mm) between the center of each pixel projected onto machine isocentric plane. Specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing.					
>>Compensator Position	(300A, 00EA)	1	DS 2	The x and y coordinates of the upper left hand corner (first pixel transmitted) of the range compensator, projected onto the machine isocentric plane in the IEC BEAM LIMITING DEVICE coordinate system (mm).					
>>Compensator Column Offset	(300A, 02E5)	1C	FL 1	The offset distance (in mm) applied to the x coordinate of the Compensator Position (300A,00EA) for even numbered rows. Required if the compensator					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				pattern is hexagonal.					
>>Compensator Physical Thickness Data	(300A, 00EC)	1	DS 1-n	A data stream of the pixel samples which comprise the range compensator, expressed as physical thickness (in mm), either parallel to radiation beam axis if Compensator Divergence (300A,02E0) equals ABSENT, or divergent according to the beam geometrical divergence if Compensator Divergence (300A,02E0) equals PRESENT. The order of pixels sent is left to right, top to bottom (upper left pixel, followed by the remainder of row 1, followed by the remainder of the rows).					
>>Isocenter to Compensator Distances	(300A, 02E6)	1C	FL 1-n	A data stream of the pixel samples which comprise the distance from the isocenter to the compensator surface closest to the radiation source (in mm). The order of pixels sent is left to right, top to bottom (upper left pixel, followed by the remainder of row 1, followed by the remainder of the rows). Required if Material ID (300A,00E1) is non-zero length, and Compensator Mounting Position (300A,02E1) is DOUBLE_SIDED. See sections PS 3.3 C.8.8.14.9 and PS 3.3 C.8.8.25.4					
>>Compensator Relative Linear Stopping Power Ratio	(300A, 02E7)	3	FL 1	Compensator Linear Stopping Power Ratio, relative to water, at the beam energy specified by the Nominal Beam Energy (300A,0114) of the first Control Point					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				of the Ion Control Point Sequence (300A,03A8).					
>>Compensator Milling Tool Diameter	(300A, 02E8)	3	FL 1	The diameter (in mm) of the milling tool to be used to create the compensator. The diameter is expressed as the actual physical size and not a projected size at isocenter.					
>Number of Boli	(300A, 00ED)	1	IS 1	Number of boli associated with current Beam.				RTT-PT	Not used
>Referenced Bolus Sequence	(300C, 00B0)	1C	SQ 1	Introduces sequence of boli associated with Beam. Required if Number of Boli (300A,00ED) is non-zero. The number of items shall be identical to the value of Number of Boli (300A,00ED).					
>>Referenced ROI Number	(3006, 0084)	1	IS 1	Uniquely identifies ROI representing the Bolus specified by ROI Number (3006,0022) in Structure Set ROI Sequence (3006,0020) in Structure Set Module within RT Structure Set in Referenced Structure Set Sequence (300C,0060) in RT General Plan Module.					
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.					
>Number of Blocks	(300A, 00F0)	1	IS 1	Number of shielding blocks associated with Beam.	No blocks in PT 1.0.			RTT-PT	Not used
>Total Block Tray Water-Equivalent Thickness	(300A, 00F3)	3	FL 1	Water-Equivalent thickness of the block tray (in mm) parallel to radiation beam axis.					
>Ion Block Sequence	(300A, 03A6)	1C	SQ 1	Introduces sequence of blocks associated with Beam. Required if Number of Blocks (300A,00F0) is					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				non-zero. The number of items shall be identical to the value of Number of Blocks (300A,00F0).					
>>Block Tray ID	(300A, 00F5)	3	SH 1	User-supplied identifier for block tray.					
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.					
>>Isocenter to Block Tray Distance	(300A, 00F7)	1	FL 1	Isocenter to downstream edge of block tray (mm). Required if Block Sequence (300A,00F4) is sent. See section PS 3.3 C.8.8.25.4					
>>Block Type	(300A, 00F8)	1	CS 1	Type of block. See section PS 3.3 C.8.8.14.4. Enumerated Values: SHIELDING blocking material is inside contour APERTURE blocking material is outside contour					
>>Block Divergence	(300A, 00FA)	1	CS 1	Indicates presence or otherwise of geometrical divergence. Enumerated Values: PRESENT block edges are shaped for beam divergence ABSENT block edges are not shaped for beam divergence					
>>Block Mounting Position	(300A, 00FB)	1	CS 1	Indicates on which side of the Block Tray the block is mounted. Enumerated Values: PATIENT_SIDE the block is mounted on the side of the Block Tray which is towards the patient. SOURCE_SIDE the block is mounted on the side of the Block Tray which is towards the radiation source.					
>>Block Number	(300A, 00FC)	1	IS 1	Identification number of the					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				Block. The value of Block Number (300A,00FC) shall be unique within the Beam in which it is created.					
>>Block Name	(300A, 00FE)	3	LO 1	User-defined name for block.					
>>Material ID	(300A, 00E1)	2	SH 1	User-supplied identifier for material used to manufacture Block.					
>>Block Thickness	(300A, 0100)	1	DS 1	Physical thickness of block (in mm) parallel to radiation beam axis. See section PS 3.3 C.8.8.14.4.					
>>Block Number of Points	(300A, 0104)	1	IS 1	Number of (x,y) pairs defining the block edge.					
>>Block Data	(300A, 0106)	1	DS 2-2n	A data stream of (x,y) pairs which comprise the block edge. The number of pairs shall be equal to Block Number of Points (300A,0104), and the vertices shall be interpreted as a closed polygon. Coordinates are projected onto the machine isocentric plane in the IEC BEAM LIMITING DEVICE coordinate system (mm).					
>Snout Sequence	(300A, 030C)	3	SQ 1	Introduces sequence of Snouts associated with Beam. Only a single item shall be permitted in this sequence.	No snouts in PT1.0				
>>Snout ID	(300A, 030F)	1	SH 1	User or machine supplied identifier for Snout.					
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.					
>Applicator Sequence	(300A, 0107)	3	SQ 1	Introduces sequence of Applicators associated with Beam. Only a single item shall be permitted in this sequence.					
>>Applicator ID	(300A, 0108)	1	SH 1	User or machine supplied identifier for Applicator. See section PS 3.3					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				C.8.8.14.12					
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.					
>>Applicator Type	(300A, 0109)	1	CS 1	Type of applicator. Defined Terms: ION_SQUARE square ion applicator ION_RECT rectangular ion applicator ION_CIRC circular ion applicator ION_SHORT short ion applicator ION_OPEN open (dummy) ion applicator INTEROPERATIVE interoperative (custom) applicator STEREOTACTIC stereotactic applicator					
>>Applicator Description	(300A, 010A)	3	LO 1	User-defined description for Applicator.					
>Number of Range Shifters	(300A, 0312)	1	IS 1	Number of range shifters associated with current beam.		1		RTT-PT	Tx Beams: Read. 0 or 1 Imaging Beams and Motion Beams: Not used
>Range Shifter Sequence	(300A, 0314)	1C	SQ 1	Introduces sequence of range shifters associated with Beam. Required if Number of Range Shifters (300A,0312) is non-zero. The number of items shall be identical to the value of Number of Range Shifters (300A,0312).				RTT-PT	Tx Beams: Read Imaging Beams and Motion Beams: Not used
>>Range Shifter Number	(300A, 0316)	1	IS 1	Identification number of the Range Shifter. The value of Range Shifter Number (300A,0316) shall be unique within the Beam in which it is created.		1		RTT-PT	Tx Beams: Read Imaging Beams and Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
>>Range Shifter ID	(300A, 0318)	1	SH 1	User or machine supplied identifier for Range Shifter.	Identifier of a BeamModifierIn Tray instance in Admin&Config (BeamModifierIn Tray.Identifier). This instance in turn refers to a BeamModifier instance and to the (virtual) Accessory Tray in which the Range Shifter is mounted. The BeamModifier.T ype is expected to be RangeShifterTy pe. TxSessionData. NET provides a method to directly navigate from the Beam to the BeamModifierIn Tray instance in Admin&Config without explicitely going through the identifiers.	123		RTT-PT	Tx Beams: Read Imaging Beams and Motion Beams: Not used
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.					
>>Range Shifter Type	(300A, 0320)	1	CS 1	Type of Range Shifter. Defined Terms: ANALOG Device is variable thickness and is composed of opposing sliding wedges, water column or similar mechanism. BINARY Device is composed of different thickness materials that can be moved in or out of the beam in various stepped combinations.		BINARY			
>>Range Shifter Description	(300A, 0322)	3	LO 1	User defined description of Range Shifter.					
>Number of Lateral Spreading Devices	(300A, 0330)	1	IS 1	Number of lateral spreading devices associated with current beam.	No lateral spreading devices in PT1.0			RTT-PT	Not used
>Lateral Spreading Device Sequence	(300A, 0332)	1C	SQ 1	Introduces sequence of lateral spreading devices associated with					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				Beam. Required if Number of Lateral Spreading Devices (300A,0330) is non-zero. The number of items shall be identical to the value of Number of Lateral Spreading Devices (300A,0330).					
>>Lateral Spreading Device Number	(300A, 0334)	1	IS 1	Identification number of the Lateral Spreading Device. The value of Lateral Spreading Device Number (300A,0334) shall be unique within the Beam in which it is created.					
>>Lateral Spreading Device ID	(300A, 0336)	1	SH 1	User or machine supplied identifier for Lateral Spreading Device.					
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.					
>>Lateral Spreading Device Type	(300A, 0338)	1	CS 1	Type of Lateral Spreading Device. Defined Terms: SCATTERER metal placed into the beam path to scatter charged particles laterally. MAGNET switchyard configuration of magnet devices to expand beam laterally.					
>>Lateral Spreading Device Description	(300A, 033A)	3	LO 1	User-defined description for lateral					
>Number of Range Modulators	(300A, 0340)	1	IS 1	Number of range modulators associated with current beam.		1		RTT-PT	Tx Beams: Read. 0 or 1 Imaging Beams and Motion Beams: Always 0
>Range Modulator Sequence	(300A, 0342)	1C	SQ 1	Introduces sequence of range modulators associated with Beam. Required if Number of Range Modulators (300A,0340) is non-zero. The	Note that Ripple Filters are a specific kind of Range Modulators.			RTT-PT	Tx Beams: Read. Used to store ripple filter Imaging Beams

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				number of items shall be identical to the value of Number of Range Modulators (300A,0340).					and Motion Beams: Not used
>>Range Modulator Number	(300A, 0344)	1	IS 1	Identification number of the Range Modulator. The value of Range Modulator Number (300A,0344) shall be unique within the Beam in which it is created.		1		RTT-PT	Tx Beams: Read Imaging Beams and Motion Beams: Not used
>>Range Modulator ID	(300A, 0346)	1	SH 1	User or machine supplied identifier for Range Modulator.	Identifier of a BeamModifierIn Tray instance in Admin&Config (BeamModifierIn Tray.Identifier). This instance in turn refers to a BeamModifier instance and to the (virtual) Accessory Tray in which the Range Modulator is mounted. The BeamModifier.T ype is expected to be RangeModulator Type (or more specifically: RippleFilterType). TxSessionData. NET provides a method to directly navigate from the Beam to the BeamModifierIn Tray instance in Admin&Config without explicitely going through the identifiers.	124		RTT-PT	Tx Beams: Read Imaging Beams and Motion Beams: Not used
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.					
>>Range Modulator Type	(300A, 0348)	1	CS 1	Type of Range Modulator. Defined Terms: FIXED fixed modulation width and weights using ridge filter or constant speed wheel with constant beam current WHL_FIXEDWEIG HTS		FIXED		RTT-PT	Tx Beams: Read. Always FIXED Imaging Beams and Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				selected wheel/track (Range Modulator ID) is spinning at constant speed. Modulation width is adjusted by switching constant beam current on and off at wheel steps indicated by Range Modulator Gating Values WHL_MODWEIGHTS selected wheel/track (Range Modulator ID) is spinning at constant speed. Weight per wheel step is adjusted by modulating beam current according to selected Beam Current Modulation ID (300A,034C). Only one item in the Range Modulator Sequence (300A,0342) can have a Range Modulator Type (300A,0348) of WHL_MODWEIGHTS.					
>>Range Modulator Description	(300A, 034A)	3	LO 1	User-defined description of Range Modulator.					
>>Beam Current Modulation ID	(300A, 034C)	1C	SH 1	User-supplied identifier for the beam current modulation pattern. Required if Range Modulator Type (300A,0348) is WHL_MODWEIGHTS					
>Number of Therapy Detectors	(300B, xxA3)	3	IS 1	Number of Therapy Detectors associated with current beam.				RTT-PT	Read
>Therapy Detector Sequence	(300B, xxA4)	3	SQ 1	Introduces sequence of Therapy Detectors associated with Beam. Required if Number of Therapy Detectors (300B,xxA3) is non-zero. The number of items shall be identical to the value of Number of Therapy Detectors (300B,xxA3).				RTT-PT	Read

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
>>Therapy Detector Number	(300B, xxA5)	1	IS 1	Identification number of the Therapy Detector. The value of Therapy Detector Number (300B,xxA5) shall be unique within the Beam in which it is created.				RTT-PT	Read
>>Therapy Detector Setup ID	(300B, xxA6)	1	SH 1	User or machine supplied identifier for setup containing Therapy Detector.	This is the ID of the corresponding TherapyDetector InPhantom instance in Admin&Config			RTT-PT	Read
>Patient Support Type	(300A, 0350)	1	CS 1	Defined terms: TABLE Treatment delivery system table CHAIR Treatment delivery system chair		TABLE		RTT-PT	Read. Always TABLE
>Patient Support ID	(300A, 0352)	3	SH 1	User-specified identifier for manufacturer specific patient support devices.					
>Patient Support Accessory Code	(300A, 0354)	3	LO 1	A Patient Support accessory identifier to be read by a device such as a bar code reader.					
>Fixation Light Azimuthal Angle	(300A, 0356)	3	FL 1	Azimuthal angle (degrees) of the fixation light coordinate around IEC BEAM LIMITING DEVICE Y-axis. Used for eye treatments. See section PS 3.3 C.8.8.25.6.4.					
>Fixation Light Polar Angle	(300A, 0358)	3	FL 1	Polar angle (degrees) of the fixation light coordinate. Used for eye treatments. See section PS 3.3 C.8.8.25.6.4.					
>Final Cumulative Meterset Weight	(300A, 010E)	1C	DS 1	Value of Cumulative Meterset Weight (300A,0134) for final Control Point in Ion Control Point Sequence (300A,03A8). Required if Cumulative Meterset Weight is non-null in Control Points specified within Ion Control Point Sequence.	Sum of all ioncounts of all beamspots of all controlpoints of this beam.			RTT-PT	Tx Beams: Read Imaging Beams and Motion Beams: Always 0 Contradiction to below!
>Number of Control Points	(300A, 0110)	1	IS 1	Number of control points in Beam.				RTT-PT	Tx Beams:

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				Value shall be greater than or equal to 2.					Read. Two subsequent control points define an energy slice. Imaging Beams and Motion Beams: Read
>Ion Control Point Sequence	(300A, 03A8)	1	SQ 1	Introduces sequence of machine configurations describing Ion treatment beam. The number of items shall be identical to the value of Number of Control Points (300A,0110).	If the TPS just calculates a beam's dose, all beam modifier parameters are only read by the DCO SC. If a plan optimization is done, the DCO SC will copy all these parameters from CP0 into all the other CP which it creates.			RTT-PT	Read
>>Control Point Index	(300A, 0112)	1	IS 1	Index of current Control Point, starting at 0 for first Control Point.				RTT-PT	Read. Incremented by 1, starting with 0 in CP0.
>>Cumulative Meterset Weight	(300A, 0134)	2	DS 1	Cumulative weight to current control point. Cumulative Meterset Weight for the first item in Control Point Sequence shall always be zero. Cumulative Meterset Weight for the final item in Ion Control Point Sequence shall always be equal to Final Cumulative Meterset Weight.	Sum of all ioncounts of all controlpoints up to but not including the current one. Example for 2 segments (4 control points): CP0 contains 0, CP1 contains SummedIonCounts(First spotmap), CP2 contains SummedIonCounts(First spotmap), CP3 contains SummedIonCounts(First spotmap+Second spotmap)			RTT-PT	Consistency checked. TxBeams: Read and written from end control point. Used for dose tracking. CP0 = 0 CP1 = value1 CP2 = value1 CP3 = value2 CP4 = value2 CP5 = value3 …. Imaging Beams

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
									and Motion Beams: 0 for CP0, 1 for CP1
>>Referenced Dose Reference Sequence	(300C, 0050)	3	SQ 1	Introduces a sequence of Dose References for current Beam. One or more items may be included in this sequence.					
>>>Referenced Dose Reference Number	(300C, 0051)	1	IS 1	Uniquely identifies Dose Reference specified by Dose Reference Number (300A,0012) in Dose Reference Sequence (300A,0010) in RT Prescription Module.					
>>>Cumulative Dose Reference Coefficient	(300A, 010C)	2	DS 1	Coefficient used to calculate cumulative dose contribution from this Beam to the referenced Dose Reference at the current Control Point.					
>>Nominal Beam Energy	(300A, 0114)	1C	DS 1	Nominal Beam Energy at control point in MeV per nucleon. Defined at nozzle entrance before all Beam Modifiers. Required for first item of Control Point Sequence, or if Nominal Beam Energy changes during Beam, and KVp (0018,0060) is not present.	First controlpoint of each segment must contain energy of the iso-energy slice.			RTT-PT	Consistency not checked TxBeams: written and read from start control point. Imaging Beams and Motion Beams: Not used. Dummy value in CP0 = 0
>>KVp	(0018, 0060)	1C	DS 1	Peak kilo voltage output of the setup X-Ray generator to be used. Required for first item of Control Point Sequence, or if KVp changes during setup, and Nominal Beam Energy (300A,0114) is not present.					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
>>Meterset Rate	(300A, 035A)	3	FL 1	Specifies the speed of delivery of the specified dose in units specified by Primary Dosimeter Unit (300A, 00B3) per minute.					
>>Ion Wedge Position Sequence	(300A, 03AC)	1C	SQ 1	Introduces sequence of Wedge positions for current control point. Required for first item of Ion Control Point Sequence if Number of Wedges (300A,00D0) is non-zero, and in subsequent control points if Wedge Position (300A,0118) or Wedge Thin Edge Position (300A,00DB) changes during beam. The number of items shall be identical to the value of Number of Wedges (300A,00D0).	No wedges in PT1.0				
>>>Referenced Wedge Number	(300C, 00C0)	1	IS 1	Uniquely references Wedge described by Wedge Number (300A,00D2) in Wedge Sequence (300A,00D1).					
>>>Wedge Position	(300A, 0118)	1	CS 1	Position of Wedge at current Control Point. Enumerated Values: IN OUT					
>>>Wedge Thin Edge Position	(300A, 00DB)	1C	FL 1	Closest distance from the central axis of the beam along a wedge axis to the thin edge as projected to the machine isocentric plane (mm). Value is positive is the wedge does not cover the central axis, negative if it does. Required if Wedge Type (300A,00D3) of the wedge referenced by Referenced Wedge Number (300C,00C0) is PARTIAL_STAND					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				ARD or PARTIAL_MOTORIZ.					
>>Range Shifter Settings Sequence	(300A, 0360)	1C	SQ 1	Introduces sequence of Range Shifter settings for the current control point. One or more items may be included in this sequence. Required for first item of Control Point Sequence if Number of Range Shifters (300A,0312) is non-zero, or if Range Shifter Setting (300A,0362) changes during Beam.				RTT-PT	Consistency checked. Tx Beams: Read. Only 1 range shifter supported. Only in first CP, as range shifter does not change during beam. Imaging Beams and Motion Beams: Not used
>>>Referenced Range Shifter Number	(300C, 0100)	1	IS 1	Uniquely references Range Shifter described by Range Shifter Number (300A,0316) in Range Shifter Sequence (300A,0314).				RTT-PT	Consistency checked. Tx Beams: Read. Only present in CP0. Not present in other CPs. Imaging Beams and Motion Beams: Not used
>>>Range Shifter Setting	(300A, 0362)	1	LO 1	Machine specific setting attribute for the range shifter. The specific encoding of this value should be documented in a Conformance Statement.				RTT-PT	Consistency checked. Tx Beams: Used. CP0: IN if range shifter present, OUT if no range shifter used. Not present in other CPs.

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
									Imaging Beams and Motion Beams: Not used
>>>Isocenter to Range Shifter Distance	(300A, 0364)	3	FL 1	Distance from Isocenter to downstream edge of range shifter (mm) at current control point	At RTT-PT, the exact value of the Isocenter to Range Shifter Distance is taken from the last created Ion Beam Treatement Record. TPS uses an approximate value (written by VSIM). VSim reads a predefined RS-to-surface distance from A&C. The RS is automatically positioned with that distance from the patient surface. VSim calculates then the RS to isocenter distance and writes it to DICOM. The exact value can not be known to the TPS without a full 3D model of the treatment room and devices. If this distance is checked before treatment, then a large tolerance must be conceived for that entry. As this is not very critical according to Joerg Bohsung, it is deferred checking against a tolerance value to a later version.	Roughly in the order of 20 to 80 cm.		RTT-PT	Consistency checked. Tx Beams: Read. Only present in CP0. Not present in other CPs. Imaging Beams and Motion Beams: Not used
>>>Range Shifter Water Equivalent Thickness	(300A, 0366)	3	FL 1	Water equivalent thickness (in mm) of the range shifter at the central axis for the beam energy incident upon the device.					
>>Lateral Spreading Device Settings	(300A, 0370)	1C	SQ 1	Introduces sequence of Lateral Spreading Device settings for					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Sequence				the current control point. One or more items may be included in this sequence. Required for first item of Control Point Sequence if Number of Lateral Spreading Devices (300A,0330) is non-zero, or if Lateral Spreading Device Setting (300A,0372) changes during Beam.					
>>>Referenced Lateral Spreading Device Number	(300C, 0102)	1	IS 1	Uniquely references Lateral Spreading Device described by Lateral Spreading Device Number (300A,0334) in Lateral Spreading Device Sequence (300A,0332).					
>>>Lateral Spreading Device Setting	(300A, 0372)	1	LO 1	Machine specific setting attribute for the lateral spreading device. The specific encoding of this value should be documented in a Conformance Statement. See section PS 3.3 C.8.8.25.5.					
>>>Isocenter to Lateral Spreading Device Distance	(300A, 0374)	3	FL 1	Isocenter to downstream edge of Lateral Spreading Device (mm) at current control point. See section PS 3.3 C.8.8.25.4					
>>>Lateral Spreading Device Water Equivalent Thickness	(300A, 033C)	3	FL 1	Water equivalent thickness (in mm) of the lateral spreading device at the central axis for the beam energy incident upon the device.					
>>Range Modulator Settings Sequence	(300A, 0380)	1C	SQ 1	Introduces sequence of Range Modulator Settings for current control point. One or more items may be included in this sequence. Required for first item of Control Point Sequence if Number of Range Modulators (300A,0340) is non-zero, or if	Ripple Filters are Range Modulators				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				Range Modulator Setting changes during Beam.					
>>>Referenced Range Modulator Number	(300C,0104)	1	IS 1	Uniquely references Range Modulator described by Range Modulator Number (300A,0344) in Range Modulator Sequence (300A,0342).					
>>>Range Modulator Gating Start Value	(300A,0382)	1C	FL 1	Start position defines the range modulator position at which the beam is switched on. Required if Range Modulator Type (300A,0348) of the range modulator referenced by Referenced Range Modulator Number (300C,0104) is WHL_MODWEIGHTS or WHL_FIXEDWEIGHTS					
>>>Range Modulator Gating Stop Value	(300A,0384)	1C	FL 1	Stop position defines the range modulator position at which the beam is switched off. Required if Range Modulator Type (300A,0348) of the range modulator referenced by Referenced Range Modulator Number (300C,0104) is WHL_MODWEIGHTS or WHL_FIXEDWEIGHTS					
>>>Range Modulator Gating Start Water Equivalent Thickness	(300A,0386)	3	FL 1	If Range Modulator Type (300A,0348) is WHL_MODWEIGHTS or WHL_FIXEDWEIGHTS: Water equivalent thickness (in mm) of the range modulator at the position specified by Range Modulator Gating Start Value (300A,0382). If Range Modulator Type (300A,0348) is FIXED: Minimum water equivalent					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				thickness (in mm) of the range modulator.					
>>>Range Modulator Gating Stop Water Equivalent Thickness	(300A, 0388)	3	FL 1	If Range Modulator Type (300A,0348) is WHL_MODWEIGHTS or WHL_FIXEDWEIGHTS: Water equivalent thickness (in mm) of the range modulator at the position specified by Range Modulator Gating Stop Value (300A,0384). If Range Modulator Type (300A,0348) is FIXED: Maximum water equivalent thickness (in mm) of the range modulator.					
>>>Isocenter to Range Modulator Distance	(300A, 038A)	3	FL 1	Isocenter to downstream edge of range modulator (mm) at current control point. See section PS 3.3 C.8.8.25.4					
>>Therapy Detector Settings Sequence	(300B, xxA7)	3	SQ 1	Introduces sequence of Therapy Detector settings for the current control point. One or more items may be included in this sequence. Required for first item of Control Point Sequence if Number of Therapy Detectors (300B, ..) is non-zero, or if Therapy Detector Setting (300B, ..) changes during Beam.				RTT-PT	Read
>>>Referenced Therapy Detector Number	(300B, xxA8)	1	IS 1	Uniquely references Therapy Detector described by Therapy Detector Number (300B,xxA5) in Therapy Detector Sequence (300B,xxA4).				RTT-PT	Read
>>>Therapy Detector Position	(300B, xxA9)	1	DS 3	Therapy Detector coordinates (x,y,z) in the Therapy Detector coordinate system described in				RTT-PT	Read

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				90.001442_ER_CoordinateSystems.doc (mm).					
>>Beam Limiting Device Position Sequence	(300A, 011A)	1C	SQ 1	Introduces sequence of beam limiting device (collimator) jaw or leaf (element) positions. Required if Ion Beam Limiting Device Sequence (300A,03A4) is included and for first item of Control Point Sequence, or if Beam Limiting Device changes during Beam. One or more items may be included in this sequence.					
>>>RT Beam Limiting Device Type	(300A, 00B8)	1	CS 1	Type of beam limiting device (collimator). The value of this attribute shall correspond to RT Beam Limiting Device Type (300A,00B8) defined in an item of Ion Beam Limiting Device Sequence (300A,03A4). Enumerated Values: X = symmetric jaw pair in IEC X direction Y = symmetric jaw pair in IEC Y direction ASYMX = asymmetric jaw pair in IEC X direction ASYMY = asymmetric pair in IEC Y direction MLCX = multileaf (multi-element) jaw pair in IEC X direction MLCY = multileaf (multi-element) jaw pair in IEC Y direction					
>>>Leaf/Jaw Positions	(300A, 011C)	1	DS 2-2n	Positions of beam limiting device (collimator) leaf (element) or jaw pairs (in mm) in IEC BEAM LIMITING DEVICE coordinate axis appropriate to RT Beam Limiting Device Type (300A,00B8), e.g. X-axis for MLCX, Y-axis for MLCY. Contains 2N values, where N is the Number of					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				Leaf/Jaw Pairs (300A,00BC) in Ion Beam Limiting Device Sequence (300A,03A4). Values shall be listed in IEC leaf (element) subscript order 101, 102, ... 1N, 201, 202, ... 2N. See section PS 3.3 C.8.8.25.3.					
>>Gantry Angle	(300A, 011E)	1C	DS 1	Gantry angle of radiation source, i.e. orientation of IEC GANTRY coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees). Required for first item of Control Point Sequence, or if Gantry Angle changes during Beam.	The Gantry Angle corresponds to the angle phi of the Gantry System as described in the ER Coordinate Systems.			RTT-PT	Consistency checked. Read. Only present in CP0. Not present in other CPs. Tx Beams: The gantry angle is the BAMS angle. The BAMS angle is fix. Imaging Beams: not interpreted Motion Beams: not interpreted
>>Gantry Rotation Direction	(300A, 011F)	1C	CS 1	Direction of Gantry Rotation when viewing gantry from isocenter, for segment following Control Point. Required for first item of Control Point Sequence, or if Gantry Rotation Direction changes during Beam. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation				RTT-PT	Consistency checked. Read. NONE in CP0. Not present in other CPs.
>>Imager Angular Angle	(300B, xx24)	3	DS 1	Angle describing the rotation of the OFF-PLANE	The Imager Angular Angle corresponds to			RTT-PT	Consistency checked

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				coordinate system around the positive X-Axis direction of the imager center coordinate system. A positive angle corresponds to a clockwise rotation as viewed in the direction of the X-Axis.	the angle psi of the Imager rotation system as described in the ER Coordinate Systems.				. Tx Beams : Not used Imaging Beams: Read. Only present in CP0. Not present in other CPs. Motion Beams : Written for Park Imager
>>Imager Angular Rotation Direction	(300B, xx29)	3	CS 1	Direction of imager angular rotation. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation	TPS uses only right-handed coordinate systems and -rotations. A positive angle value thus always means clock-wise rotation.CW rotation.			RTT-PT	Consistency checked. Tx Beams : Not used Imaging Beams: Read. Only present in CP0. Not present in other CPs. Motion Beams : Written for Park Imager
>>Imager Iso-centric Angle	(300B, xx25)	3	DS 1	Angle describing the rotation of the imager center coordinate system with respect to the IEC FIXED coordinate system (degrees). Required for first item of Control Point Sequence, or if the Isocentric Angle changes during the imager beam.	The Imager Iso-centric Angle corresponds to the angle theta of the Imager center system as described in the ER Coordinate Systems.			RTT-PT	Consistency checked. Tx Beams : Not used Imaging Beams: Read. Only present in CP0. Not present in other CPs. Motion Beams : Written for Park Imager
>>Imager Isocentric Rotation	(300B, xx2A)	3	CS 1	Direction of imager isocentric rotation. Enumerated Values:	Always CW in our case.			RTT-PT	Consistency checked

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Direction				CW clockwise CC counter-clockwise NONE no rotation					. Tx Beams : Not used Imaging Beams: Read. Only present in CP0. Not present in other CPs. Motion Beams : Written for Park Imager
>> Imager Orbital Angle	(300B, xx2C)	3	DS 1	Angle describing the rotation of the imager coordinate system with respect to the imager rotation system in degrees.	The Imager Orbital Angle corresponds to the angle phi of the Imager system as described in the ER Coordinate Systems. For a robot based system, this angle describes the rotation of the C-arm around the patient.			RTT-PT	Consistency checked. Tx Beams : Not used Imaging Beams: Read. Only present in CP0. Not present in other CPs. Motion Beams : Written for Park Imager
>> Imager Orbital Rotation Direction	(300B, xx2F)	3	CS 1	Direction of imager orbital rotation. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation	Always CW in our case.			RTT-PT	Consistency checked. Tx Beams : Not used Imaging Beams: Read. Only present in CP0. Not present in other CPs. Motion Beams : Written for Park Imager
>>Imager Vertical Position	(300B, xx26)	3	DS 1	Robot Imager Vertical position in the IEC FIXED coordinate system	The Imager Vertical Position corresponds to the			RTT-PT	Consistency checked

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				(mm).	displacement in delta_z of the Imager center system (cf. ER Coordinate Systems)				. Imaging Beams : Read. Only present in CP0. Not present in other CPs. Tx Beams: Not used Motion Beams : Written for Park Imager
>>Imager Longitudinal Position	(300B, xx27)	3	DS 1	Robot Imager Longitudinal position in the IEC FIXED coordinate system (mm).	The Imager Longitudinal Position corresponds to the displacement delta_y of the Imager center system (cf. ER Coordinate Systems)			RTT-PT	Consistency checked. Imaging Beams: Read. Only present in CP0. Not present in other CPs. Tx Beams: Not used. Motion Beams : Written for Park Imager
>>Imager Lateral Position	(300B, xx28)	3	DS 1	Robot Imager Lateral position in the IEC FIXED coordinate system (mm).	The Imager Lateral Position corresponds to the displacement delta_x of the Imager center system (cf. ER Coordinate Systems).			RTT-PT	Consistency checked. Imaging Beams : Read. Only present in CP0. Not present in other CPs. Tx Beams: Not used. Motion Beams : Written for Park Imager
>>Gantry Pitch Angle	(300A, 014A)	2C	FL 1	Angle describing the rotation of the OFF-PLANE coordinate system	The Source-off plane Angle corresponds to the angle psi of				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				around the positive X-Axis direction of the IEC GANTRY coordinate system. A positive angle corresponds to a clockwise rotation as viewed in the direction of the X-Axis. The zero angle describes a radiation source on the Z-Axis of the IEC GANTRY system. Required for first item of Control Point Sequence, or if Source Off-Plane Angle changes during Beam. See section PS 3.3 C.8.8.14.8.	the Gantry off-plane coordinate system (cf. ER Coordinate Systems). The PT gantry does not support OFF_PLANE rotation in PT1.0. For now, 0 is written.				
>>Gantry Pitch Rotation Direction	(300A, 014C)	2C	CS 1	Direction of Source Off-Plane Rotation with respect to the X-Axis direction of the IEC GANTRY coordinate system, for segment following Control Point. Required for first item of Control Point Sequence, or if Source Off-Plane Rotation Direction changes during Beam. See PS 3.3 C.8.8.14.8. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation	Not required in PT1.0				
>>Beam Limiting Device Angle	(300A, 0120)	1C	DS 1	Beam Limiting Device angle, i.e. orientation of IEC BEAM LIMITING DEVICE coordinate system with respect to IEC GANTRY coordinate system (degrees). Required for first item of Control Point Sequence, or if Beam Limiting Device Angle changes during Beam.	For the TPS this angle is defined relative to the Gantry off-plane coordinate system, which exists as a suggestion for extension of IEC 61217 but not yet for DICOM. However, this slightly different definition would only hurt in the case of 3 non-planar beam lines - which is not foreseen.				
>>Beam Limiting Device Rotation	(300A, 0121)	1C	CS 1	Direction of Beam Limiting Device Rotation when viewing beam					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Direction				limiting device (collimator) from radiation source, for segment following Control Point. Required for first item of Control Point Sequence, or if Beam Limiting Device Rotation Direction changes during Beam. See section PS 3.3 C.8.8.14.8. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation					
>>Scan Spot Tune ID	(300A, 0390)	1C	SH 1	User-supplied or machine code identifier for machine configuration to produce beam spot. This may be the nominal spot size or some other machine specific value. Required if Scan Mode (300A,0308) is MODULATED.	In syngo RT context, this attribute shall contain the the nominal spot size in mm.			RTT-PT	Comment by HP related to OCS_00053743: This is the focus value that must be sent to the TCS
>>Number of Scan Spot Positions	(300A, 0392)	1C	IS 1	Number of spot positions used to specify scanning pattern for current segment beginning at control point. Required if Scan Mode (300A,0308) is MODULATED.				RTT-PT	Consistency checked TxBeams: written and read from start control point. Imaging Beams and Motion Beams: Not used
>>Scan Spot Position Map	(300A, 0394)	1C	FL 1-n	The x and y coordinates of the scan spots are defined as projected onto the machine isocentric plane in the IEC GANTRY coordinate system (mm). Required if Scan Mode (300A,0308) is MODULATED. Contains 2N values where N is the Number of	Scan Spot Positions are stored in the order as determined by the scan path optimization algorithm. Scan Spot Positions with a weight of '0' are removed. These positions are stored in both ControlPoints of each segment.			RTT-PT	Consistency not checked TxBeams: written and read from start control point. Imaging Beams and

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				Scan Spot Positions (300A,0392).					Motion Beams: Not used
>>Scan Spot Meterset Weights	(300A, 0396)	1C	FL 1-n	A data set of meterset weights corresponding to scan spot positions. The order of weights matches the positions in Scan Spot Positions (300A,0394). The sum contained in all meterset weights must match the difference of the cumulative meterset weight of the current control point to the following control point. Required if Scan Mode (300A,0308) is MODULATED.	Ioncounts are stored in the same order as above. Note that they are only stored in the first ControlPoint of each segment, they contain only 0s for the second ControlPoint.			RTT-PT	Consistency not checked. TxBeams: written and read from start control point. Imaging Beams and Motion Beams: Not used RTT-PT (and TCS) can safely ignore scan spots with weight '0'.
>>Scanning Spot Size	(300A, 0398)	3	FL 2	The Scanning Spot Size as calculated using the Full Width Half Maximum (FWHM). Specified by a numeric pair - the size measured in air at isocenter in IEC GANTRY X direction (delimiter) the size in the IEC GANTRY Y direction (mm).				RTT-PT	Comment by HP related to OCS_00053743: the meaning of this attribute for RTT-PT is unclear and needs to be discussed between TPS and RTT_PT. Consistency not checked. TxBeams: written and read from start control

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
									point. Only present in CP0. Not present in other CPs. This attribute is sometimes also referenced as focus of the beam. Imaging Beams and Motion Beams: Not used
>>Number of Paintings	(300A, 039A)	1C	IS 1	The number of times the scan pattern given by Scan Spot Position Map (300A,0394) and Scan Spot Meterset Weights (300A,0396) shall be applied at the current control point. To obtain the meterset weight per painting, the values in the Scan Spot Meterset Weights (300A,0396) should be divided by the value of this attribute. Required if Scan Mode (300A,0308) is MODULATED.				RTT-PT	Consistency checked. Tx Beams: Read. Only present in CP0. Not present in other CPs. Imaging Beams and Motion Beams: Not used (always 1)
>>Patient Support Angle	(300A, 0122)	1C	DS 1	Patient Support angle, i.e. orientation of IEC PATIENT SUPPORT (turntable) coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees). Required for first item of Control Point Sequence, or if Patient Support Angle changes during Beam.	The Patient Support Angle corresponds to the isocentric rotation angle theta as defined for the Patient support system or the table top system, direct in the ER Coordinate Systems.			RTT-PT	Consistency checked. Read. Only present in CP0. Not present in other CPs. For Tx Beams and Imaging Beams called isocentric angle.
>>Patient	(300A,	1C	CS 1	Direction of	Always CW in			RTT-	Read in

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Support Rotation Direction	0123)			Patient Support Rotation when viewing table from above, for segment following Control Point. Required for first item of Control Point Sequence, or if Patient Support Rotation Direction changes during Beam. See section PS 3.3 C.8.8.14.8. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation	our case.			PT	CP0 for creating RT Ion Beams Session Record. Not further evaluated.
>>Table Top Pitch Angle	(300A, 0140)	2C	FL 1	Table Top Pitch Angle, i.e. the rotation of the IEC TABLE TOP coordinate system about the X-axis of the IEC TABLE TOP coordinate system (degrees). Required for first item of Control Point Sequence, or if Table Top Pitch Angle changes during Beam. See section PS 3.3 C.8.8.25.6.2.	The Patient support pitch angle corresponds to the angle psi as defined for the Pitched patient support system in the ER Coordinate Systems.			RTT-PT	Consistency checked. Read. Only present in CP0. Not present in other CPs.
>>Table Top Pitch Rotation Direction	(300A, 0142)	2C	CS 1	Direction of Table Top Pitch Rotation when viewing the table along the positive X-axis of the IEC TABLE TOP coordinate system, for segment following Control Point. Required for first item of Control Point Sequence, or if Table Top Pitch Rotation Direction changes during Beam. See PS 3.3 C.8.8.14.8 and PS 3.3 C.8.8.25.6.2. Enumerated Values: CW = clockwise CC = counter-clockwise	Always CW in our case.			RTT-PT	Read in CP0 for creating RT Ion Beams Session Record. Not further evaluated.

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				NONE = no rotation					
>>Table Top Roll Angle	(300A, 0144)	2C	FL 1	Table Top Roll Angle, i.e. the rotation of the IEC TABLE TOP coordinate system about the Y-axis of the IEC TABLE TOP coordinate system (degrees). Required for first item of Control Point Sequence, or if Table Top Roll Angle changes during Beam. See section PS 3.3 C.8.8.25.6.2.	The Patient support roll angle corresponds to the angle phi as defined for the Rolled patient support system in the ER Coordinate Systems.			RTT-PT	Consistency checked. Read. Only present in CP0. Not present in other CPs.
>>Table Top Roll Rotation Direction	(300A, 0146)	2C	CS 1	Direction of Table Top Roll Rotation when viewing the table along the positive Y-axis of the IEC TABLE TOP coordinate system, for segment following Control Point. Required for first item of Control Point Sequence, or if Table Top Roll Rotation Direction changes during Beam. See PS 3.3 C.8.8.14.8 and PS 3.3 C.8.8.25.6.2. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation	Always CW in our case.			RTT-PT	Read in CP0 for creating RT Ion Beams Session Record. Not further evaluated.
>>Head Fixation Angle	(300A, 0148)	3	FL 1	Angle (in degrees) of the head fixation for eye treatments with respect to the Patient Support Pitch Angle (300A,0140) coordinate system. Positive head fixation angle is the same direction as positive Patient Support pitch. See section PS 3.3 C.8.8.25.6.4.					
>>Table Top Vertical Position	(300A, 0128)	2C	DS 1	Table Top Vertical position in IEC TABLE TOP coordinate system (mm). Required for	The Table Top Vertical Position corresponds to the negative vertical			RTT-PT	Consistency checked. Read.

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				first item of Control Point Sequence, or if Table Top Vertical Position changes during Beam.	displacement of the Table Top System, direct (i.e. -delta_z, cf. ER Coordinate Systems). See comment for table top lateral position.				Only present in CP0. Not present in other CPs. empty in relative beams
>>Table Top Longitudinal Position	(300A, 0129)	2C	DS 1	Table Top Longitudinal position in IEC TABLE TOP coordinate system (mm). Required for first item of Control Point Sequence, or if Table Top Longitudinal Position changes during Beam.	The Table Top Longitudinal Position corresponds to the negative longitudinal displacement of the Table Top System, direct (i.e. -delta_y cf. ER Coordinate Systems). See comment for table top lateral position.			RTT-PT	Consistency checked. Read. Only present in CP0. Not present in other CPs.
>>Table Top Lateral Position	(300A, 012A)	2C	DS 1	Table Top Lateral position in IEC TABLE TOP coordinate system (mm). Required for first item of Control Point Sequence, or if Table Top Lateral Position changes during Beam.	The Table Top Lateral Position corresponds to the negative lateral displacement of the Table Top System, direct (i.e. -delta_x cf. ER Coordinate Systems). Please note that the translation vector in table top coordinates as used in the ER Coordinate Systems points from the origin of the table top system to the origin of the IEC fixed system. The Table Top Lateral/Longitudinal/Vertical positions form a translation vector from the origin of the IEC fixed system to the origin of the Table Top System (expressed in the - potentially rotated - table top system). The values here are thus exactly the negative of the values of the translation vector as used in the ER.			RTT-PT	Consistency checked. Read. Only present in CP0. Not present in other CPs.
>>Snout	(300A,	2C	FL 1	Axial position of	no snouts in				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Position	030D)			the snout (in mm) measured from isocenter to the downstream side of the snout (without consideration of variable length elements such as blocks, MLC and/or compensators). Required for first item in Control Point Sequence, or if Snout Position changes during Beam.	PT1.0				
>>Isocenter Position	(300A, 012C)	2C	DS 3	Isocenter coordinates (x,y,z) in the patient based coordinate system described in PS 3.3 C.7.6.2.1.1 (mm). Required for first item of Segment Control Point Sequence, or if Segment Isocenter Position changes during Beam.					
>>Surface Entry Point	(300A, 012E)	3	DS 3	Patient surface entry point coordinates (x,y,z), along the central axis of the beam, in the patient based coordinate system described in PS 3.3 C.7.6.2.1.1 (mm).					
> Referenced Target ROI Sequence	(300B, xx80)	3	SQ 1	Introduces a sequence of target ROIs associated with this beam. Required if the beam only references a subset of ROIs in Structure Set Module.	A beam may be restricted to a subset of target (!) ROIs. There are some limitations with respect to the applicable optimization algorithm, though! If no such SQ exists in the plan, it is assumed that all targets are assigned to this beam. In such a case, all expansion margins are taken to be 0.	Refers to the PTV			
>> Referenced ROI Number	(3006, 0084)	1	IS 1	Uniquely identifies the ROIs representing targets for this beam, specified by ROI number in					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				Structure Set ROI Sequence in Structure Set Module within RT Structure Set in Referenced Structure Set Sequence in RT General Plan Module.					
>> Target ROI lateral expansion margin	(300B, xx82)	3	DS 1	Specifies the lateral extension of the target in mm within which beamspots may be placed. This value overrides a possible value stored in Target lateral expansion margin in sequence Target expansion sequence.	Introduced to have the possibility to have individual expansion margins for each target of a beam.	0			
>> Target ROI distal expansion margin	(300B, xx83)	3	DS 1	Specifies the extension of the distal boundary of the target volume in mm within which beamspots may still be placed. This value overrides a possible value stored in Target lateral expansion margin in sequence Target expansion sequence.		0			
>> Target ROI proximal expansion margin	(300B, xx84)	3	DS 1	Specifies the extension of the proximal boundary of the target volume in mm within which beamspots may still be placed. This value overrides a possible value stored in Target lateral expansion margin in sequence Target expansion sequence.		0			
> Beam Weight	(300B, xx87)	3	DS 1	Relative beam weight wrt the other beams in the plan. If the value is not present or null, a default of 1 is assumed.	Before being applied for dose optimization, the relative beam weights of all beams in a plan are scaled such that they sum up to 100%. It can not be used scaling through cumulative meterset weight because in case				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
					of carbon, effective doses to not add in a linear way.				
> Display Color	(300B, xx9C)	3	IS 3	Display color of the beam stored as 3 RGB values in the range of 0..255.					
> Scan grid lateral distance	(300B, xx85)	3	DS 2	The lateral resolution of the scan grid in mm. Specified by a numeric pair - the distance at isocenter in IEC Gantry X and IEC Gantry Y direction.	It is preferred to have two shadow attributes, lateral and longitudinal grid distance, instead of specifying the complete scan spot position map with each beam. This measure can still be used in the case of complex scan grid geometries - which is not planned for right now. Same as for the range step/ripple filter: when the user selects a FWHM value, the system automatically sets the appropriate lateral grid size in the UI (the scaling factor is defined in Admin&Config), but not vice versa.	Possible values are 1, 2, 3, 4, 5, 6, 7, 8, 9, 10mm.			
> Scan grid longitudinal distance	(300B, xx86)	3	DS 1	Longitudinal distance of energy planes in mm.	s.a.				
> Beam Group Name	(300B, xx9D)	3	SH 1	Name of the beam group this beam belongs to. Beams are grouped having common isocenter.					
Split plane sequence	(300B, xx9B)	3	SQ 1	Introduces a list of split planes	A beam can be divided into 2 or more sub-beams along its direction. DEFERRED				
> Point on plane	(300B, xx89)	1	DS 3	Defines the plane's position	Split planes are defined in the beam coordinate system				
> Norm vector of plane	(300B, xx8A)	1	DS 3	Defines the plane's orientation					
> Plane thickness	(300B, xx8B)	1	DS 1	Width of overlap area, in mm					
> Beam	(300A,	1	IS 1	References the	It is still unclear				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
number	00C0)			beam in the beam sequence which is the split beam	if a split beam will be stored as several DICOM beams with an offset wrt. to each other, or if it will be stored as a single beam with table movements in between.				

8.8.25 RT Ion Beams Session Record Mod

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
Operator Name	(0008, 1070)	2	PN 1-n	Name of operator administering treatment session.			RTT-PT	Written
Referenced Fraction Group Number	(300C, 0022)	3	IS 1	Identifier of fraction group within referenced RT Ion Plan.		Used	RTT-PT	Modified
Number of Fractions Planned	(300A, 0078)	2	IS 1	Total number of treatments (fractions) planned for current fraction group.			RTT-PT	Tx FG: Written. The total number of fractions planned for this group. It is identified from the fractionation plan in the fraction group. PosVerif group : Not Set and Motion FG: Not Used
Primary Dosimeter Unit	(300A, 00B3)	1	CS 1	Measurement unit of the machine dosimeter. Enumerated Values: MU Monitor Units MAMPSEC MilliAmp Seconds NP Number of Particles		Used	RTT-PT	Written Tx Beams: Always set to NP Imaging Beams: Always set to MU Motion Beams: Not used
Treatment Session Ion Beam Sequence	(3008, 0021)	1	SQ 1	Introduces sequence of setup and/or treatment beams administered during treatment session. One or more items may be included in this sequence.		Used	RTT-PT	Written

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>Referenced Beam Number	(300C, 0006)	1	IS 1	References Beam specified by Beam Number (300A,00C0) in Ion Beam Sequence (300A,03A2) in RT Ion Beams Module within the referenced RT Ion Plan.			RTT-PT	Tx Beams and Imaging Beams : Written For every delivered Imaging or Tx FG in Tx session a separate Ion beam record IOD is created.
>Record ID	(300B, xx67)	3	LO 1	Before delivery of a beam the record is already commited to the local database containing the Record ID. The Record ID is a unique number for each delivery of each beam. Based on the Record ID the physical beam record can be identified at the TCS.			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>Treatment Room Temperature	(300B, xx98)	3	DS 1	Treatment Room Temperature in degrees Celsius (°C).			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>Treatment Room Air Pressure	(300B, xx99)	3	DS 1	Treatment Room Pressure in Pascal (Pa)	Used Pascal as standard SI unit for pressure. In DICOM, also Torr is found. Conversions: 1 Bar=10^5Pa, 1Torr~133,3Pa		RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>Beam Name	(300A, 00C2)	1	LO 1	User-defined name for Beam. See Note 1.			RTT-PT	Written
>Beam Description	(300A, 00C3)	3	ST 1	User-defined description for Beam. See Note 1.			RTT-PT	Written
>Beam Type	(300A, 00C4)	1	CS 1	Motion characteristic of Beam. Enumerated Values: STATIC all beam parameters remain unchanged during delivery DYNAMIC one or more beam parameters changes during delivery			RTT-PT	Written. Always STATIC

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>Radiation Type	(300A, 00C6)	1	CS 1	Particle type of Beam. Defined Terms: PHOTON PROTON ION			RTT-PT	Tx Beams: Written. Set to ION or PROTON Imaging Beams: Written. Set to PHOTON Motion Beams: Not used
>Radiation Mass Number	(300A, 0302)	1C	IS 1	Mass number of radiation. Required if Radiation Type (300A,00C6) is ION			RTT-PT	Tx Beams: Modified Imaging Beams and Motion Beams: Not used
>Radiation Atomic Number	(300A, 0304)	1C	IS 1	Atomic number of radiation. Required if Radiation Type (300A,00C6) is ION			RTT-PT	Tx Beams: Modified Imaging Beams and Motion Beams: Not used
>Radiation Charge State	(300A, 0306)	1C	SS 1	Charge state of radiation. Required if Radiation Type (300A,00C6) is ION			RTT-PT	Tx Beams: Modified Imaging Beams and Motion Beams: Not used
>Scan Mode	(300A, 0308)	1	CS 1	Defined terms: NONE UNIFORM MODULATED			RTT-PT	Tx Beams: Modified Imaging Beams and Motion Beams: Not used
>Referenced Tolerance Table Number	(300C, 00A0)	3	IS 1	Uniquely identifies Ion Tolerance Table specified by Tolerance Table Number (300A,0042) within Ion Tolerance Table Sequence in RT Ion Tolerance Tables Module. These tolerances are to be used for verification of treatment machine settings.			RTT-PT	Tx Beams and Imaging Beams: Modified. Used to identify the global tolerance table that is used Motion Beams: Not used
>Beam Limiting Device Leaf Pairs Sequence	(3008, 00A0)	3	SQ 1	Introduces sequence of beam limiting device (collimator) jaw or leaf (element) sets. One or more items may be included in this sequence.				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>RT Beam Limiting Device Type	(300A, 00B8)	1	CS 1	Type of beam limiting device (collimator). Enumerated Values: X symmetric jaw pair in IEC X direction Y symmetric jaw pair in IEC Y direction ASYMX asymmetric jaw pair in IEC X direction ASYMY asymmetric pair in IEC Y direction MLCX multileaf (multi-element) jaw pair in IEC X direction MLCY multileaf (multi-element) jaw pair in IEC Y direction				
>>Number of Leaf/Jaw Pairs	(300A, 00BC)	1	IS 1	Number of leaf (element) or jaw pairs (equal to 1 for standard beam limiting device jaws).				
>Referenced Patient Setup Number	(300C, 006A)	3	IS 1	Uniquely identifies Ion Patient Setup to be used for current beam, specified by Patient Setup Number (300A,0182) within Patient Setup Sequence of RT Patient Setup Module.			RTT-PT	Modified. References a RT Patient Setup module in the Beams Treatment record. This Setup module stores the patient setup at the time of treatment of the beam.
>Referenced Verification Image Sequence	(300C, 0040)	3	SQ 1	Introduces sequence of verification images obtained during delivery of current beam. One or more items may be included in this sequence.			RTT-PT	Imaging Beams: Modified. Tx Beams and Motion Beams: Not used
>>Referenced SOP Class UID	(0008, 1150)	1	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced Reference Image Sequence (300C,0042) is sent.			RTT-PT	Imaging Beams: Modified. Tx Beams and Motion Beams: Not used
>>Referenced SOP Instance UID	(0008, 1155)	1	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced Reference Image			RTT-PT	Imaging Beams: Modified. Tx Beams and Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				Sequence (300C,0042) is sent.				
>Imager Organ Program	(300B, xx12)	3	LO 1	Private attribute storing the organ program used to acquire the image at the AX system			RTT-PT	Imaging Beams: Written. Tx Beams and Motion Beams: Not used
>Imager Organ Program Name	(300B, xxE9)	3	LO 1	Private attribute storing the Human readable organ program name used to acquire the image at the AX system			RTT-PT	Imaging Beams: Written. Tx Beams and Motion Beams: Not used
>Referenced Measured Dose Reference Sequence	(3008, 0080)	3	SQ 1	Introduces sequence of doses measured during treatment delivery for current Beam. The sequence may contain one or more items.			RTT-PT	Not used. Attribute "Phantom Detector Measurement" XML based tag is used instead.
>>Referenced Dose Reference Number	(300C, 0051)	1C	IS 1	Uniquely references Dose Reference specified by Dose Reference Number (300A,0012) in Dose Reference Sequence (300A,0010) in RT Prescription Module of referenced RT Ion Plan. Required if Referenced Measured Dose Reference Number (3008,0082) is not sent.			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>>Referenced Measured Dose Reference Number	(3008, 0082)	1C	IS 1	Uniquely references Measured Dose Reference specified by Measured Dose Reference Number (3008,0064) in Measured Dose Reference Sequence (3008,0010). Required if Referenced Dose Reference Number (300C, 0051) is not sent.			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Measured Dose Value	(3008, 0016)	1	DS 1	Measured Dose in units specified by Dose Units (3004,0002) in sequence referenced by Measured Dose Reference Sequence (3008,0010) or Dose Reference Sequence (300A,0010) in RT Prescription Module of referenced RT Ion Plan as defined above.			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>Referenced Calculated Dose Reference Sequence	(3008, 0090)	3	SQ 1	Introduces sequence of doses estimated for each treatment delivery. The sequence may contain one or more items.			RTT-PT	Tx Beams: This sequence is not used, but the calculated dose module is used instead
>>Referenced Dose Reference Number	(300C, 0051)	1C	IS 1	Uniquely identifies Dose Reference specified by Dose Reference Number (300A, 0012) in Dose Reference Sequence (300A, 0010) in RT Prescription Module of referenced RT Ion Plan. Required if Referenced Calculated Dose Reference Number (3008,0092) is not sent.				
>>Referenced Calculated Dose Reference Number	(3008, 0092)	1C	IS 1	Uniquely identifies Calculated Dose Reference specified by Calculated Dose Reference Number (3008,0072) within Calculated Dose Reference Sequence (3008,0070). Required if Referenced Dose Reference Number (300C,0051) is not sent.				
>>Calculated Dose Reference Dose Value	(3008, 0076)	1	DS 1	Calculated Dose (Gy).				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>Number of Wedges	(300A, 00D0)	1	IS 1	Number of wedges associated with current beam.				
>Recorded Wedge Sequence	(3008, 00B0)	1C	SQ 1	Introduces sequence of treatment wedges. Required if Number of Wedges (300A,00D0) is non-zero. The number of items shall be identical to the value of Number of Wedges (300A,00D0).				
>>Wedge Number	(300A, 00D2)	1	IS 1	Identification number of the Wedges. The value of Wedge Number (300A,00D2) shall be unique within the Beam in which it was created.				
>>Wedge Type	(300A, 00D3)	2	CS 1	Type of wedge (if any) defined for Beam. Defined Terms: STANDARD standard (static) wedge MOTORIZED single wedge which can be removed from beam remotely. PARTIAL_STANDARD wedge does not extend across the whole field and is operated manually. PARTIAL_MOTORIZ wedge does not extend across the whole field and can be removed from beam remotely.				
>>Wedge ID	(300A, 00D4)	3	SH 1	User-supplied identifier for Wedge.				
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.				
>>Wedge Angle	(300A, 00D5)	2	IS 1	Nominal wedge angle (degrees).				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Wedge Orientation	(300A, 00D8)	2	DS 1	Orientation of wedge, i.e. orientation of IEC WEDGE FILTER coordinate system with respect to the IEC BEAM LIMITING DEVICE coordinate systems (degrees).				
>Number of Compensators	(300A, 00E0)	1	IS 1	Number of range compensators associated with current Beam.				
>Recorded Compensator Sequence	(3008, 00C0)	1C	SQ 1	Introduces sequence of treatment compensators. Required if Number of Compensators (300A,00E0) is non-zero. The number of items shall be identical to the value of Number of Compensators (300A,00E0).				
>>Referenced Compensator Number	(300C, 00D0)	1	IS 1	Uniquely identifies compensator specified by Compensator Number (300A,00E4) within Beam referenced by Referenced Beam Number (300C,0006).				
>>Compensator ID	(300A, 00E5)	3	SH 1	User-supplied identifier for compensator.				
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.				
>Number of Boli	(300A, 00ED)	1	IS 1	Number of boli associated with current Beam.				
>Referenced Bolus Sequence	(300C, 00B0)	1C	SQ 1	Introduces sequence of boli associated with Beam. Required if Number of Boli (300A,00ED) is non-zero. The number of items shall be identical to the value of Number of Boli (300A,00ED).				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Referenced ROI Number	(3006, 0084)	1	IS 1	Uniquely identifies ROI representing the Bolus specified by ROI Number (3006,0022) in Structure Set ROI Sequence (3006,0020) in Structure Set Module within RT Structure Set in Referenced Structure Set Sequence (300C,0060) in RT General Plan Module.				
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.				
>Number of Blocks	(300A, 00F0)	1	IS 1	Number of shielding blocks associated with Beam.				
>Recorded Block Sequence	(3008, 00D0)	1C	SQ 1	Introduces sequence of blocks associated with Beam. Required if Number of Blocks (300A,00F0) is non-zero. The number of items shall be identical to the value of Number of Blocks (300A,00F0).				
>>Block Tray ID	(300A, 00F5)	3	SH 1	User-supplied identifier for block tray.				
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.				
>>Referenced Block Number	(300C, 00E0)	1	IS 1	Uniquely identifies block specified by Block Number (300A,00FC) within Beam referenced by Referenced Beam Number (300C,0006).				
>>Block Name	(300A, 00FE)	3	LO 1	User-defined name for block.				
>Recorded Snout Sequence	(3008, 00F0)	1C	SQ 1	Introduces sequence of Snouts associated with Beam. Required if Snout Sequence (300A,030C) is included in the RT				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				Ion Plan referenced within the Referenced RT Plan Sequence (300C,0002). Only a single item shall be permitted in this sequence.				
>>Snout ID	(300A, 030F)	1	SH 1	User or machine supplied identifier for Snout.				
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.				
>Applicator Sequence	(300A, 0107)	1C	SQ 1	Introduces sequence of Applicators associated with Beam. Required if Applicator Sequence (300A,0107) is included in the RT Ion Plan referenced within the Referenced RT Plan Sequence (300C,0002). Only a single item shall be permitted in this sequence.				
>>Applicator ID	(300A, 0108)	1	SH 1	User or machine supplied identifier for Applicator. See PS 3.3 C.8.8.14.12				
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.				
>>Applicator Type	(300A, 0109)	1	CS 1	Type of applicator. Defined Terms: ION_SQUARE square ion applicator ION_RECT rectangluar ion applicator ION_CIRC circular ion applicator ION_SHORT short ion applicator ION_OPEN open (dummy) ion applicator INTEROPERATIVE interoperative (custom) applicator STEREOTACTIC				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				stereotactic applicator				
>>Applicator Description	(300A, 010A)	3	LO 1	User-defined description for Applicator.				
>Number of Range Shifters	(300A, 0312)	1	IS 1	Number of range shifters associated with current beam.			RTT-PT	Tx Beams: Written (either 0 or 1) Imaging Beams and Motion Beams: Not used
>Recorded Range Shifter Sequence	(3008, 00F2)	1C	SQ 1	Introduces sequence of range shifters recorded with Beam. Required if Number of Range Shifters (300A,0312) is non-zero. The number of items shall be identical to the value of Number of Range Shifters (300A,0312).			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>>Referenced Range Shifter Number	(300C, 0100)	1	IS 1	Uniquely identifies range shifter specified by Range Shifter Number (300A,0316) within Beam referenced by Referenced Beam Number (300C,0006).			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>>Range Shifter ID	(300A, 0318)	1	SH 1	User or machine supplied identifier for Range Modulator.			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>>Beam Modifier Type	(300B, xx31)	3	SH 1	Type name of the modifier used.			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				such as a bar code reader.				
>Number of Lateral Spreading Devices	(300A, 0330)	1	IS 1	Number of lateral spreading devices associated with current beam.				
>Recorded Lateral Spreading Device Sequence	(3008, 00F4)	1C	SQ 1	Introduces sequence of lateral spreading devices associated with Beam. Required if Number of Lateral Spreading Devices (300A,0330) is non-zero. The number of items shall be identical to the value of Number of Lateral Spreading Devices (300A,0330).				
>>Referenced Lateral Spreading Device Number	(300C, 0102)	1	IS 1	Uniquely identifies lateral spreading device specified by Lateral Spreading Device Number (300A,0334) within Beam referenced by Referenced Beam Number (300C,0006).				
>>Lateral Spreading Device ID	(300A, 0336)	1	SH 1	User or machine supplied identifier for Lateral Spreading Device.				
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.				
>Number of Range Modulators	(300A, 0340)	1	IS 1	Number of range modulators associated with current beam.			RTT-PT	Tx Beams: Written (either 0 or 1) Imaging Beams: Written (always 0) Motion Beams: Not used
>Recorded Range Modulator Sequence	(3008, 00F6)	1C	SQ 1	Introduces sequence of range modulators associated with Beam. Required if Number of Range Modulators (300A,0340) is non-zero. The number of items shall be identical to the value of Number of Range Modulators (300A,0340).			RTT-PT	Tx Beams: Written. Used to store ripple filter Imaging Beams and Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Referenced Range Modulator Number	(300C, 0104)	1	IS 1	Uniquely identifies range modulator specified by Range Modulator Number (300A,0344) within Beam referenced by Referenced Beam Number (300C,0006).			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>>Range Modulator ID	(300A, 0346)	1	SH 1	User or machine supplied identifier for Range Modulator.			RTT-PT	Tx Beams: Modified Imaging Beams and Motion Beams: Not used
>>Beam Modifier Type	(300B, xx31)	3	SH 1	Type name of the modifier used.			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>>Accessory Code	(300A, 00F9)	3	LO 1	An accessory identifier to be read by a device such as a bar code reader.				
>>Range Modulator Type	(300A, 0348)	1	CS 1	Type of Range Modulator. Defined Terms: FIXED fixed modulation width and weights using ridge filter or constant speed wheel with constant beam current WHL_FIXEDWEIGHTS selected wheel/track (Range Modulator ID) is spinning at constant speed. Modulation width is adjusted by switching constant beam current on and off at wheel steps indicated by Range Modulator Interrupt Values WHL_MODWEIGHTS selected wheel/track (Range Modulator ID) is spinning at constant speed. Weight per wheel step is adjusted by modulating beam current according to selected Beam Current Modulation ID (300A,034C) Only one item in the Recorded Range Modulator				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				Sequence (3008,00F6) can have a Range Modulator Type (300A,0348) of WHL_MODWEIGHTS.				
>>Beam Current Modulation ID	(300A, 034C)	1C	SH 1	User-supplied identifier for the beam current modulation pattern. Required if Range Modulator Type (300A,0348) is WHL_MODWEIGHTS				
>Patient Support Type	(300A, 0350)	1	CS 1	Defined terms: TABLE Treatment delivery system table CHAIR Treatment delivery system chair			RTT-PT	Tx Beams: Written (always TABLE) Imaging Beams: Written (always TABLE) Motion Beams: Not used
>Patient Support ID	(300A, 0352)	3	SH 1	User-specified identifier for manufacturer specific patient support devices.				
>Patient Support Accessory Code	(300A, 0354)	3	LO 1	A Patient Support accessory identifier to be read by a device such as a bar code reader.				
>Fixation Light Azimuthal Angle	(300A, 0356)	3	FL 1	Azimuthal angle (degrees) of the fixation light coordinate around IEC PATIENT SUPPORT Y-axis. Used for eye treatments. See section PS 3.3				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				C.8.8.25.6.4.				
>Fixation Light Polar Angle	(300A, 0358)	3	FL 1	Polar angle (degrees) of the fixation light coordinate. Used for eye treatments. See section PS 3.3 C.8.8.25.6.4.				
>Current Fraction Number	(3008, 0022)	2	IS 1	Fraction number for this beam administration.			RTT-PT	Tx Beams: Written. Used to identify the fraction number as part of which, this beam was delivered (fraction number <= number of fractions delivered) Imaging Beams: Written Motion Beams: Not used
>Treatment Delivery Type	(300A, 00CE)	2	CS 1	Delivery Type of treatment. Defined Terms: TREATMENT normal patient treatment OPEN_PORTFILM portal image acquisition with open field (the source of radiation is specified by Radiation Type (300A, 00C6)) TRMT_PORTFILM portal image acquisition with treatment port (the source of radiation is specified by Radiation Type (300A,00C6)) CONTINUATION continuation of interrupted treatment SETUP no treatment beam was applied for this RT Beam. To be used for specifying the gantry, couch, and other machine positions where X-ray set-up images or measurements were taken. XA_IMAGING a beam to acquire			RTT-PT	Written. Tx Beams: Always TREATMENT, except for late resumption, where it is CONTINUATION Imaging Beams: Always XA-IMAGING Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				a XA image. PICKUP a beam that used for picking up patiet to the proper treatment/imaging position DROPOFF a beam that used to drop off patient from the treatment/imaging position. PARKIMAGER a beam to park imager				
>Treatment Termination Status	(3008, 002A)	1	CS 1	Conditions under which treatment was terminated. Enumerated Values: NORMAL treatment terminated normally OPERATOR operator terminated treatment MACHINE machine terminated treatment UNKNOWN status at termination unknown			RTT-PT	Modified
>Treatment Termination Code	(3008, 002B)	3	SH 1	Treatment machine termination code. This code is dependent upon the particular application and			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				equipment.				
>Treatment Events	(300B, xxB2)	3	UT 1	XML document data consisting of information about events during the treatment delivery, giving further explanation about the Treatment Termination Status (3008,002A). The schema is documented at \DOCS\FS\Architecture\DICOM\XML%20Schema%20for%20Private%20D			RTT-PT	TxBeams: Written Imaging and Motion Beams: Not used
>Treatment Verification Status	(3008, 002C)	2	CS 1	Conditions under which treatment was verified by a verification system. Enumerated Values: VERIFIED treatment verified VERIFIED_OVR treatment verified with at least one out-of-range value overridden NOT_VERIFIED treatment verified manually			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>Specified Primary Meterset	(3008, 0032)	3	DS 1	Desired machine setting of primary meterset in units specified by Primary Dosimeter Unit (300A, 00B3).			RTT-PT	Tx Beams: Modified. Contains the number of particles planned for the beam. Imaging Beams: Always 0 Motion Beams: Not used
>Specified Secondary Meterset	(3008, 0033)	3	DS 1	Desired machine setting of secondary meterset.				
>Delivered Primary Meterset	(3008, 0036)	3	DS 1	Machine setting actually delivered as recorded by primary meterset in units specified by Primary Dosimeter Unit (300A, 00B3).			RTT-PT	Tx Beams: Modified. Contains the number of particles delivered for the beam. Imaging Beams: Always 0 Motion Beams: Not used
>Delivered Secondary Meterset	(3008, 0037)	3	DS 1	Machine setting actually delivered as recorded by secondary meterset.				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>Phantom Detector Measurements	(300B, xxB1)	3	OW 1	XML document data consisting of information about measurement data at 24 point of phantom.The schema is documented in PhantomDetector Measurements.xsd	The XML schema is derived from the C# class in ClearCase:/ArchComp/syngo.NET/src/Services/TxSessionData/Providers/ModelFactoryBO/Core/src/RtTreatmentRecords/RtIonBeamSessionRecord/PhantomDetectorMeasurements.cs		RTT-PT	Tx Beams: Written only for 'Plan verification' mode for QA Plan. Not used otherwise. Imaging Beams and Motion Beams: Not used
>Specified Treatment Time	(3008, 003A)	3	DS 1	Treatment Time set (sec).				
>Delivered Treatment Time	(3008, 003B)	3	DS 1	Treatment Time actually delivered (sec).			RTT-PT	Tx Beams: Modified Imaging Beams and Motion Beams: Not used
>Number of Control Points	(300A, 0110)	1	IS 1	Number of control points in Beam.			RTT-PT	Written
>Ion Control Point Delivery Sequence	(3008, 0041)	1	SQ 1	Introduces sequence of beam control points for current ion treatment beam. The number of items shall be identical to the value of Number of Control Points (300A,0110). See section PS 3.3 C.8.8.21.1.			RTT-PT	Modified
>>Referenced Control Point Index	(300C, 00F0)	1	IS 1	Uniquely identifies Control Point specified by Control Point Index (300A,0112) within the Beam referenced by Referenced Beam Number (300C,0006).			RTT-PT	Modified
>>Treatment Control Point Date	(3008, 0024)	1	DA 1	Date administration of treatment beam began.			RTT-PT	Modified
>>Treatment Control Point Time	(3008, 0025)	1	TM 1	Time administration of treatment beam began.			RTT-PT	Modified

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Specified Meterset	(3008, 0042)	2	DS 1	Desired machine setting for current control point in units specified by Primary Dosimeter Unit (300A, 00B3).			RTT-PT	TxBeams: Read and written from end control point. Used for dose tracking. CP0 = 0 CP1 = value1 CP2 = value1 CP3 = value2 CP4 = value2 CP5 = value3 …. Imaging Beams: Always 0 Motion Beams: Not used
>>Delivered Meterset	(3008, 0044)	1	DS 1	Machine setting actually delivered at current control point in units specified by Primary Dosimeter Unit (300A, 00B3).			RTT-PT	TxBeams: Read and written from end control point. Used for dose tracking. CP0 = 0 CP1 = value1 CP2 = value1 CP3 = value2 CP4 = value2 CP5 = value3 …. Imaging Beams: Always 0 Motion Beams: Not used
>>Meterset Rate Set	(3008, 0045)	3	FL 1	The specified speed of delivery of the specified dose in units specified by Primary Dosimeter Unit (300A, 00B3) per minute.				
>>Meterset Rate Delivered	(3008, 0046)	3	FL 1	The delivered speed of delivery of the specified dose in units specified by Primary Dosimeter Unit (300A, 00B3) per minute.				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Nominal Beam Energy	(300A, 0114)	1C	DS 1	Nominal Beam Energy at control point in MeV per nucleon. Defined at nozzle entrance before all Beam Modifiers. Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041) or if Nominal Beam Energy (300A,0114) changes during beam administration, and KVp (0018,0060) is not present.			RTT-PT	TxBeams: Should be written with the same value in start and end control point. CP0 = CP1 CP2 = CP3 CP4 = CP5 …. Should be read from end control point. Imaging and Motion Beams: Not used. 0 as dummy value in CP0
>>KVp	(0018, 0060)	1C	DS 1	Peak kilo voltage output of the setup X-Ray generator to be used. Required for first item of Control Point Sequence, or if KVp changes during setup, and Nominal Beam Energy (300A,0114) is not present.			RTT-PT	Written. TO BE CLARIFIED
>>Ion Wedge Position Sequence	(300A, 03AC)	1C	SQ 1	Introduces sequence of Wedge positions for current control point. Required for first item of Ion Control Point Sequence if Number of Wedges (300A,00D0) is non-zero, and in subsequent control points if Wedge Position (300A,0118) or Wedge Thin Edge Position (300A,00DB) changes during beam. The number of items shall be identical to the value of Number of Wedges (300A,00D0). The number of items shall be identical to the value of Number of Wedges (300A,00D0).				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>>Referenced Wedge Number	(300C, 00C0)	1	IS 1	Uniquely references Wedge described by Wedge Number (300A,00D2) in Wedge Sequence (300A,00D1).				
>>>Wedge Position	(300A, 0118)	1	CS 1	Position of Wedge at current control point. Enumerated Values: IN OUT				
>>>Wedge Thin Edge Position	(300A, 00DB)	1C	FL 1	Closest distance from the central axis of the beam along a wedge axis to the thin edge as projected to the machine isocentric plane (mm). Value is positive is the wedge does not cover the central axis, negative if it does. Required if Wedge Type (300A,00D3) of the wedge referenced by Referenced Wedge Number (300C,00C0) is PARTIAL_STANDARD or PARTIAL_MOTORIZ.				
>> Beam Limiting Device Position Sequence	(300A, 011A)	1C	SQ 1	Introduces sequence of beam limiting device (collimator) jaw or leaf (element) positions. Required if Ion Beam Limiting Device Sequence (300A,03A4) is included and for first item of Control Point Sequence, or if Beam Limiting Device changes during Beam. One or more items may be included in this sequence.				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>>RT Beam Limiting Device Type	(300A, 00B8)	1	CS 1	Type of beam limiting device (collimator). The value of this attribute shall correspond to RT Beam Limiting Device Type (300A,00B8) defined in an item of Ion Beam Limiting Device Sequence (300A,03A4). Enumerated Values: X symmetric jaw pair in IEC X direction Y symmetric jaw pair in IEC Y direction ASYMX asymmetric jaw pair in IEC X direction ASYMY asymmetric pair in IEC Y direction MLCX multileaf (multi-element) jaw pair in IEC X direction MLCY multileaf (multi-element) jaw pair in IEC Y direction				
>>>Leaf/Jaw Positions	(300A, 011C)	1	DS 2-2n	Positions of beam limiting device (collimator) leaf (element) or jaw pairs (in mm) in IEC BEAM LIMITING DEVICE coordinate axis appropriate to RT Beam Limiting Device Type (300A,00B8), e.g. X-axis for MLCX, Y-axis for MLCY. Contains 2N values, where N is the Number of Leaf/Jaw Pairs (300A,00BC) in Ion Beam Limiting Device Sequence (300A,03A4). Values shall be listed in IEC leaf (element) subscript order 101, 102, ... 1N, 201, 202, ... 2N. See section PS 3.3 C.8.8.25.3.				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Range Shifter Settings Sequence	(300A, 0360)	1C	SQ 1	Introduces sequence of Range Shifter settings for the current control point. One or more items may be included in this sequence. Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041) or if Range Shifter Setting (300A,0362) changes during beam administration, and Number of Range Shifters (300A,0312) is non-zero.			RTT-PT	Tx Beams: Written. Only 1 range shifter possible Imaging Beams and Motion Beams: Not used
>>>Referenced Range Shifter Number	(300C, 0100)	1	IS 1	Uniquely references Range Shifter described by Range Shifter Number (300A,0316) in Range Shifter Sequence (300A,0314).			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>>>Range Shifter Setting	(300A, 0362)	1	LO 1	Machine specific setting attribute for the range shifter. The specific encoding of this value should be documented in a Conformance Statement. See section PS 3.3 C.8.8.25.5. IN If Rangeshifter was present OUT If RangeShifter was not present			RTT-PT	Tx Beams: Written. Dummy value “NONE” written Imaging Beams and Motion Beams: Not used
>>> Isocenter to Range Shifter Distance	(300A, xx64)	3	FL 1	Distance from isocenter to downstream edge of Range shifter (mm) at current control point.			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used
>>>Source to Range Shifter Distance	(300B, xx32)	3	FL 1	Distance from the Source to the Range Shifter			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Lateral Spreading Device Settings Sequence	(300A, 0370)	1C	SQ 1	Introduces sequence of Lateral Spreading Device settings for the current control point. One or more items may be included in this sequence. Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041) or if Lateral Spreading Device Setting (300A,0372) changes during beam administration, and Number of Lateral Spreading Devices (300A,0330) is non-zero.				
>>>Referenced Lateral Spreading Device Number	(300C, 0102)	1	IS 1	Uniquely references Lateral Spreading Device described by Lateral Spreading Device Number (300A,0334) in Lateral Spreading Device Sequence (300A,0332).				
>>>Lateral Spreading Device Setting	(300A, 0372)	1	LO 1	Machine specific setting attribute for the lateral spreading device. The specific encoding of this value should be documented in a Conformance Statement.				
>>Range Modulator Settings Sequence	(300A, 0380)	1C	SQ 1	Introduces sequence of Range Modulator Settings for current control point. Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041), or if Range Modulator Settings change during beam administration, and Number of Range Modulators (300A,0340) is non-zero.			RTT-PT	Tx Beams: Written. Only in CP0, since ripple filter does not change during beam. Imaging Beams and Motion Beams: Not used
>>>Referenced Range Modulator Number	(300C, 0104)	1	IS 1	Uniquely references Range Modulator described by Range Modulator Number			RTT-PT	Tx Beams: Written Imaging Beams and Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				(300A,0344) in Range Modulator Sequence (300A,0342).				
>>>Range Modulator Gating Start Value	(300A, 0382)	1C	FL 1	Start position defines the range modulator position at which the beam is switched on. Required if Range Modulator Type (300A,0348) of the range modulator referenced by Referenced Range Modulator Number (300C,0104) is WHL_MODWEIGHTS or WHL_FIXEDWEIGHTS				
>>>Range Modulator Gating Stop Value	(300A, 0384)	1C	FL 1	Stop position defines the range modulator position at which the beam is switched off. Required if Range Modulator Type (300A,0348) of the range modulator referenced by Referenced Range Modulator Number (300C,0104) is WHL_MODWEIGHTS or WHL_FIXEDWEIGHTS				
>>Gantry Angle	(300A, 011E)	1C	DS 1	Treatment machine gantry angle, i.e. orientation of IEC GANTRY coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees). Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041) or if Gantry Angle changes during beam administration.	The Gantry Angle corresponds to the angle phi of the Gantry System as described in the ER Coordinate Systems.		RTT-PT	Written. Tx Beams: BAMS angle in CP0 only, since it does not change during beam Imaging Beams: Room's BAMS angle written in CP0. Use orbital angle as gantry angle. Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Gantry Rotation Direction	(300A, 011F)	1C	CS 1	Direction of Gantry Rotation when viewing gantry from isocenter, for segment beginning at current Control Point. Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041), or if Gantry Rotation Direction changes during beam administration. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation			RTT-PT	Written. Always NONE in CP0
>>Gantry Pitch Angle	(300A, 014A)	2C	FL 1	Gantry Pitch Angle of the radiation source, i.e. the rotation of the IEC GANTRY coordinate system about the X-axis of the IEC GANTRY coordinate system (degrees). Required for first item of Control Point Sequence, or if Gantry Pitch Rotation Angle changes during Beam. See PS 3.3 C.8.8.25.6.5.	The Source-off plane Angle corresponds to the angle psi of the Gantry off-plane coordinate system (cf. ER Coordinate Systems). The PT gantry does not support OFF_PLANE rotation in PT1.0. For now, 0 is written.			
>>Gantry Pitch Rotation Direction	(300A, 014C)	2C	CS 1	Direction of Gantry Pitch Angle when viewing along the positive X-axis of the IEC GANTRY coordinate system, for segment following Control Point. Required for first item of Control Point Sequence, or if Gantry Pitch Rotation Direction changes during Beam. See PS 3.3 C.8.8.14.8 and PS 3.3 C.8.8.25.6.5. Enumerated Values: CW = clockwise CC = counter-	Always CW in our case			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				clockwise NONE = no rotation				
>>Beam Limiting Device Angle	(300A, 0120)	1C	DS 1	Beam Limiting Device (collimator) angle, i.e. orientation of IEC BEAM LIMITING DEVICE coordinate system with respect to IEC GANTRY coordinate system (degrees). Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041) or if beam limiting device (collimator) angle changes during beam administration.	For the TPS this angle is defined relative to the Gantry off-plane coordinate system, which exists as a suggestion for extension of IEC 61217 but not yet for DICOM. However, this slightly different definition would only hurt in the case of 3 non-planar beam lines - which is not foreseen.			
>>Beam Limiting Device Rotation Direction	(300A, 0121)	1C	CS 1	Direction of Beam Limiting Device Rotation when viewing beam limiting device (collimator) from radiation source, for segment beginning at current Control Point. Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041) or if Beam Limiting Device Rotation Direction changes during beam administration. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Imager Angular Angle	(300B, xx24)	3	DS 1	Angle describing the rotation of the OFF-PLANE coordinate system around the positive X-Axis direction of the imager center coordinate system. A positive angle corresponds to a clockwise rotation as viewed in the direction of the X-Axis.	The Imager Angular Angle corresponds to the angle psi of the Imager rotation system as described in the ER Coordinate Systems.		RTT-PT	Tx Beams and Motion Beams: Not used Imaging Beams: Written
>>Imager Angular Rotation Direction	(300B, xx29)	3	CS 1	Direction of imager angular rotation. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation	TPS uses only right-handed coordinate systems and -rotations. A positive angle value thus always means clock-wise rotation.CW rotation.			
>>Imager Iso-centric Angle	(300B, xx25)	3	DS 1	Angle describing the rotation of the imager center coordinate system with respect to the IEC FIXED coordinate system (degrees). Required for first item of Control Point Sequence, or if the Isocentric Angle changes during the imager beam.	The Imager Iso-centric Angle corresponds to the angle theta of the Imager center system as described in the ER Coordinate Systems.		RTT-PT	Tx Beams and Motion Beams: Not used Imaging Beams: Written
>>Imager Isocentric Rotation Direction	(300B, xx2A)	3	CS 1	Direction of imager isocentric rotation. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation	Always CW in our case.			
>> Imager Orbital Angle	(300B, xx2C)	3	DS 1	Angle describing the rotation of the imager coordinate system with respect to the imager rotation system in degrees.	The Imager Orbital Angle corresponds to the angle phi of the Imager system as described in the ER Coordinate Systems. For a robot based system, this angle describes the rotation of the C-arm around the patient.			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>> Imager Orbital Rotation Direction	(300B, xx2F)	3	CS 1	Direction of imager orbital rotation. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation	Always CW in our case.			
>>Imager Vertical Position	(300B, xx26)	3	DS 1	Robot Imager Vertical position in the IEC FIXED coordinate system (mm).	The Imager Vertical Position corresponds to the displacement in delta_z of the Imager center system (cf. ER Coordinate Systems)		RTT-PT	Tx Beams: Not used Imaging Beams: Written Motion Beams: Not used
>>Imager Longitudinal Position	(300B, xx27)	3	DS 1	Robot Imager Longitudinal position in the IEC FIXED coordinate system (mm).	The Imager Longitudinal Position corresponds to the displacement delta_y of the Imager center system (cf. ER Coordinate Systems)		RTT-PT	Tx Beams: Not used Imaging Beams: Written Motion Beams: Not used
>>Imager Lateral Position	(300B, xx28)	3	DS 1	Robot Imager Lateral position in the IEC FIXED coordinate system (mm).	The Imager Lateral Position corresponds to the displacement delta_x of the Imager center system (cf. ER Coordinate Systems).		RTT-PT	Tx Beams: Not used Imaging Beams: Written Motion Beams: Not used
>>Scan Spot Tune ID	(300A, 0390)	1C	SH 1	User-supplied or machine code identifier for machine configuration to produce beam spot. This may be the nominal spot size or some other machine specific value. Required if Scan Mode (300A,0308) is MODULATED.	shall be used as in RT Ion Beams Module		RTT-PT	Tx Beams: Written. Intensity (in steps) of the Iso Energy Slice Imaging Beams and Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Number of Scan Spot Positions	(300A, 0392)	1C	IS 1	Number of spot positions used to specify scanning pattern for current segment beginning at control point. Required if Scan Mode (300A,0308) is MODULATED.			RTT-PT	TxBeams: Should be written with the same value in start and end control point. CP0 = CP1 CP2 = CP3 CP4 = CP5 …. Should be read from end control point. Imaging and Motion Beams: Not used
>> Scan Spot Resumption Index	(300B, xxB0)	3	IS 1	Zero based index of scan spot in Scan Spot Position Map (300A,0394) where an interrupted prior treatment session was resumed during a successor treatment session.			RTT-PT	TxBeams: Written
>>Scan Spot Position Map	(300A, 0394)	1C	FL 1-n	The x and y coordinates of the scan spots are defined as projected onto the machine isocentric plane in the IEC GANTRY coordinate system (mm). Required if Scan Mode (300A,0308) is MODULATED. Contains 2N values were N is the Number of Scan Spot Positions (300A,0392).			RTT-PT	TxBeams: Should be written with the same value in start and end control point. CP0 = CP1 CP2 = CP3 CP4 = CP5 …. Should be read from end control point. Imaging and Motion Beams: Not used
>>Scan Spot Metersets Delivered	(3008, 0047)	1C	FL 1-n	A data set of metersets delivered to the scan spot positions. The order of metersets matches the positions in Scan Spot Position Map (300A,0394). The sum contained in all metersets must match the difference of the Delivered Meterset of the current control point to the following control point. Required if Scan Mode (300A,0308) is			RTT-PT	TxBeams: Should be written with the same value in start and end control point. CP0 = CP1 CP2 = CP3 CP4 = CP5 …. Should be read from end control point. Imaging and Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				MODULATED.				
>>Scanning Spot Size	(300A, 0398)	3	FL 2	The Scanning Spot Size as calculated using the Full Width Half Maximum (FWHM). Specified by a numeric pair – the size measured in air at isocenter in IEC GANTRY X direction (delimiter) the size in the IEC GANTRY Y direction (mm). This attribute is sometimes also referred to as focus of the beam.			RTT-PT	TxBeams: Should be written with the same value in start and end control point. CP0 = CP1 CP2 = CP3 CP4 = CP5 …. Should be read from end control point. Imaging and Motion Beams: Not used
>>Number of Paintings	(300A, 039A)	1C	IS 1	The intended number of times the scan pattern given by Scan Spot Position Map (300A,0394) and Scan Spot Meterset Weights (300A,0396) in the Referenced RT Plan was to be applied at the current control point. NOTE: The actual number of paintings is not known or recorded. The Scan Spot Metersets Delivered (3008,0047) contains the sum of all complete and partial repaints. Required if Scan Mode (300A,0308) is MODULATED.			RTT-PT	Tx Beams: Written. Always 1 Imaging Beams and Motion Beams: Not used

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Patient Support Angle	(300A, 0122)	1C	DS 1	Patient Support angle, i.e. orientation of IEC PATIENT SUPPORT (turntable) coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees). Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041) or if Patient Support Angle changes during beam administration.	The Patient Support Angle corresponds to the isocentric rotation angle theta as defined for the Patient support system or the table top system, direct in the ER Coordinate Systems.		RTT-PT	Written. Isocentric angle in CP0
>>Patient Support Rotation Direction	(300A, 0123)	1C	CS 1	Direction of Patient Support Rotation when viewing table from above, for segment beginning at current Control Point. Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041), or if Patient Support Rotation Direction changes during beam administration. Enumerated Values: CW=clockwise CC=counter-clockwise NONE=no rotation			RTT-PT	Written in CP0. Copied from RT Ion Beam, not further evaluated.
>>Table Top Pitch Angle	(300A, 0140)	2C	FL 1	Table Top Pitch Angle, i.e. the rotation of the IEC TABLE TOP coordinate system about the X-axis of the IEC TABLE TOP coordinate system (degrees). Required for first item of Control Point Sequence, or if Table Top Pitch Angle changes during Beam. See section PS 3.3 C.8.8.25.6.2.	The Patient support pitch angle corresponds to the angle psi as defined for the Pitched patient support system in the ER Coordinate Systems.		RTT-PT	Written

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Table Top Pitch Rotation Direction	(300A, 0142)	2C	CS 1	Direction of Table Top Pitch Rotation when viewing the table along the positive X-axis of the IEC TABLE TOP coordinate system, for segment following Control Point. Required for first item of Control Point Sequence, or if Table Top Pitch Rotation Direction changes during Beam. See PS 3.3 C.8.8.14.8 and PS 3.3 C.8.8.25.6.2. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation			RTT-PT	Written in CP0. Copied from RT Ion Beam, not further evaluated.
>>Table Top Roll Angle	(300A, 0144)	2C	FL 1	Table Top Roll Angle, i.e. the rotation of the IEC TABLE TOP coordinate system about the Y-axis of the IEC TABLE TOP coordinate system (degrees). Required for first item of Control Point Sequence, or if Table Top Roll Angle changes during Beam. See section PS 3.3 C.8.8.25.6.2	The Patient support roll angle corresponds to the angle phi as defined for the RoleId patient support system in the ER Coordinate Systems.		RTT-PT	Written
>>Table Top Roll Rotation Direction	(300A, 0146)	2C	CS 1	Direction of Table Top Roll Rotation when viewing the table along the positive Y-axis of the IEC TABLE TOP coordinate system, for segment following Control Point. Required for first item of Control Point Sequence, or if Table Top Roll Rotation Direction changes			RTT-PT	Written in CP0. Copied from RT Ion Beam, not further evaluated.

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				during Beam. See PS 3.3 C.8.8.14.8 and PS 3.3 C.8.8.25.6.2. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation.				
>>Head Fixation Angle	(300A, 0148)	3	FL 1	Angle (in degrees) of the head fixation for eye treatments with respect to the Patient Support Pitch Angle (300A,0140) coordinate system. Positive head fixation angle is the same direction as positive Patient Support pitch. See section				
>>Table Top Vertical Position	(300A, 0128)	2C	DS 1	Table Top Vertical position in IEC TABLE TOP coordinate system (mm). This value is interpreted as an absolute, rather than relative, Table setting. Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041) or if Table Top Vertical Position changes during beam administration.	The Table Top Vertical Position corresponds to the displacement delta_z of the Table Top System, direct (cf. ER Coordinate Systems)		RTT-PT	Written
>>Table Top Longitudinal Position	(300A, 0129)	2C	DS 1	Table Top Longitudinal position in IEC TABLE TOP coordinate system (mm). This value is interpreted as an absolute, rather than relative, Table setting. Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041) or if Table Top Longitudinal Position changes during beam administration.	The Table Top Longitudinal Position corresponds to the displacement delta_y of the Table Top System, direct (cf. ER Coordinate Systems)		RTT-PT	Written

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Table Top Lateral Position	(300A, 012A)	2C	DS 1	Table Top Lateral position in IEC TABLE TOP coordinate system (mm). This value is interpreted as an absolute, rather than relative, Table setting. Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041) or if Table Top Lateral Position changes during beam administration.	The Table Top Lateral Position corresponds to the displacement delta_x of the Table Top System, direct (cf. ER Coordinate Systems)		RTT-PT	Written
>>Snout Position	(300A, 030D)	2C	FL 1	Axial position of the snout (in mm) measured from isocenter to the downstream side of the snout (without consideration of variable length elements such as blocks, MLC and/or compensators). Required for Control Point 0 of Ion Control Point Delivery Sequence (3008,0041) or if Snout Position changes during beam administration.				
>>Corrected Parameter Sequence	(3008, 0068)	3	SQ 1	Introduces a sequence of items describing corrections made to any attributes prior to delivery of the next control point. The sequence may contain one or more items.				
>>>Parameter Sequence Pointer	(3008, 0061)	1	AT 1	Contains the Data Element Tag of the parent sequence containing the attribute that was corrected. The value is limited in scope to the Treatment Session Ion Beam Sequence (3008, 0021) and all nested sequences therein.				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>>Parameter Item Index	(3008, 0063)	1	IS 1	Contains the ones-based sequence item index of the corrected attribute within its parent sequence as indicated by Parameter Sequence Pointer (3008,0061).				
>>>Parameter Pointer	(3008, 0065)	1	AT 1	Contains the Data Element Tag of the attribute which was corrected.				
>>>Correction Value	(3008, 006A)	1	FL 1	The relative value applied to value referenced by the Parameter Sequence Pointer (3008,0061), Parameter Item Index (3008,0063) and Parameter Pointer				
>>Override Sequence	(3008, 0060)	3	SQ 1	Introduces sequence of parameters which were overridden during the administration of the beam segment immediately prior to the current control point. The sequence may contain one or more items.			RTT-PT	Written only if override happens. Tx and Imaging Beams: written to and read from start control point. Motion Beams: Not used
>>>Parameter Sequence Pointer	(3008, 0061)	1	AT 1	Contains the Data Element Tag of the parent sequence containing the attribute that was overriden. The value is limited in scope to the Treatment Session Ion Beam Sequence (3008,0021) and all nested sequences therein.			RTT-PT	Tx Beams and Imaging Beams: Written only if override happens. Motion Beams: Not used
>>>Override Parameter Pointer	(3008, 0062)	1	AT 1	Contains the Data Element Tag of the attribute which was overridden. (Not used???)				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>>Parameter Item Index	(3008, 0063)	1	IS 1	Contains the ones-based sequence item index of the overriden attributes within it's parent sequence. The value is limited in scope to the Treatment Session Ion Beam Sequence (3008, 0021) and all nested sequences therein.			RTT-PT	Tx Beams and Imaging Beams: Written only if override happens. Motion Beams: Not used
>>>Operator Name	(0008, 1070)	2	PN 1-n	Name of operator who authorized override.			RTT-PT	Tx Beams: Written only if override happens. Motion Beams and Imaging Beams: Not used
>>>Override Reason	(3008, 0066)	3	ST 1	User-defined description of reason for override of parameter specified by Override Parameter Pointer (3008,0062). (Not used???)			RTT-PT	Written

8.8.26 RT Ion Tolerance Tables Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Ion Tolerance Table Sequence	(300A, 03A0)	1	SQ 1	Introduces sequence of ion tolerance tables to be used for delivery of treatment plan. One or more items may be included. See Note below.	Tolerance Tables values will not be written into the RT ION Tolerance Table Module. Not consider 3.rd party communication for PT1.0.		Used	RTT-PT	Read
>Tolerance Table Number	(300A, 0042)	1	IS 1	Identification number of the Tolerance Table. The value of Tolerance Table Number (300A,0042) shall be unique within the RT Ion Plan in which it is created.		1		RTT-PT	Read
>Tolerance Table Label	(300A, 0043)	3	SH 1	User-defined label for Tolerance Table.	In PT context, the Tolerance Table Label is the identifier of a tolerance table in Admin&Config (ToleranceTable .Identifier).	"HEAD & NECK"		RTT-PT	Read.
>Gantry	(300A,	3	DS 1	Maximum					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Angle Tolerance	0044)			permitted difference (in degrees) between planned and delivered Gantry Angle. Not used.					
>Beam Limiting Device Angle Tolerance	(300A, 0046)	3	DS 1	Maximum permitted difference (in degrees) between planned and delivered Beam Limiting Device Angle. Not used.					
>Beam Limiting Device Tolerance Sequence	(300A, 0048)	3	SQ 1	Introduces sequence of beam limiting device (collimator) tolerances. One or more items may be included in this sequence. Not used.					
>>RT Beam Limiting Device Type	(300A, 00B8)	1	CS 1	Type of beam limiting device (collimator). Enumerated Values: X symmetric jaw pair in IEC X direction Y symmetric jaw pair in IEC Y direction ASYMX asymmetric jaw pair in IEC X direction ASYMY asymmetric pair in IEC Y direction MLCX multileaf (multi-element) jaw pair in IEC X direction MLCY multileaf (multi-element) jaw pair in IEC Y direction					
>>Beam Limiting Device Position Tolerance	(300A, 004A)	1	DS 1	Maximum permitted difference (in mm) between planned and delivered leaf (element) or jaw positions for current beam limiting device (collimator). Not used.					
>Patient Support Angle Tolerance	(300A, 004C)	3	DS 1	Maximum permitted difference (in degrees) between planned and delivered Patient Support Angle. Not used.					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
>Table Top Vertical Position Tolerance	(300A, 0051)	3	DS 1	Maximum permitted difference (in mm) between planned and delivered Table Top Vertical Position. Not used.					
>Table Top Longitudinal Position Tolerance	(300A, 0052)	3	DS 1	Maximum permitted difference (in mm) between planned and delivered Table Top Longitudinal Position. Not used.					
>Table Top Lateral Position Tolerance	(300A, 0053)	3	DS 1	Maximum permitted difference (in mm) between planned and delivered Table Top Lateral Position. Not used.					
>Patient Support Pitch Angle Tolerance	(300A, 004F)	3	FL 1	Maximum permitted difference (in degrees) between planned and delivered Patient Support Pitch Angle.					
>Patient Support Roll Angle Tolerance	(300A, 0050)	3	FL 1	Maximum permitted difference (in degrees) between planned and delivered Patient Support Roll Angle. Not used.					
>Snout Position Tolerance	(300A, 004B)	3	FL 1	Maximum permitted difference (in mm) between planned and delivered Snout Position. Not used.					

8.8.27 RT Patient Setup Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
Patient Setup Sequence	(300A, 0180)	1	SQ 1	Introduces sequence of patient setup data for current plan. One or more items may be included in this sequence.		Used if Referenced by Tx Beams	RTT-PT	RT Ion Plan IOD: Read. RTT-PT assumes that only one setup is present in the sequence.
Private Extensions for this module can be found in "RT General Plan::External Attributes"								

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>Patient Setup Number	(300A, 0182)	1	IS 1	Identification number of the Patient Setup. The value of Patient Setup Number (300A,0182) shall be unique within the RT Plan in which it is created.			RTT-PT	RT Ion Plan IOD: Read RT Ion Beams Treatment Record IOD: Written. Same as that in the RT Ion Plan if it's a relative setup
>Patient Setup Label	(300A, 0183)	3	LO 1	The user-defined label for the patient setup.			RTT-PT	RT Ion Plan IOD: Read RT Ion Beams Treatment Record IOD: Written. Same as that in the RT Ion Plan if it's a relative setup
>Referenced Setup Image Sequence	(300A, 0401)	3	SQ 1	Introduces sequence of setup verification images for this patient setup. One or more items may be included in this sequence.	Images with modality SC or VL serve as visible light photos for visual setup control. Images with modality RTIMAGE serve as reference images on plan level. RT Images present in this sequence shall not be referenced in the Referenced Reference Image Sequence (300C,0042) of the RT Beams module.		RTT-PT	RT Ion Plan IOD: Used to identify the photos
>>Setup Image Comment	(300A, 0402)	3	ST 1	Comment on the Setup Image.				
>>Include 'Image SOP Instance Reference Macro'								
>Patient Position	(0018,5 100)	1C	CS 1	Patient position descriptor relative to the equipment. Required if Patient Additional Position (300A,0184) is not present.			RTT-PT	RT Ion Plan IOD: Read RT Ion Beams Treatment Record IOD: Written. Same as that in the RT Ion Plan if it's a relative setup
>Patient Additional Position	(300A, 0184)	1C	LO 1	User-defined additional description of patient position. Required if			RTT-PT	RT Ion Plan IOD: Modified (only for the

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				Patient Position (0018,5100) is not present.				Additional Patient Setup generated during the Plan Enrichment) RT Ion Beams Treatment Record IOD: Written. Same as that in the RT Ion Plan if it's a relative setup
>Fixation Device Sequence	(300A, 0190)	3	SQ 1	Introduces sequence of Fixation Devices used in Patient Setup. One or more items may be included in this sequence.			RTT-PT	RT Ion Plan IOD: Not Used
>>Fixation Device Type	(300A, 0192)	1C	CS 1	Type of Fixation Device used during in Patient Setup. Required if Fixation Device Sequence (300A,0190) is sent. Defined Terms: BITEBLOCK HEADFRAME MASK MOLD CAST HEADREST BREAST_BOARD BODY_FRAME VACUUM_MOLD WHOLE_BODY_POD RECTAL_BALLOON				
>>Fixation Device Label	(300A, 0194)	2C	SH 1	User-defined label identifier for Fixation Device. Required if Fixation Device Sequence (300A,0190) is sent.				
>>Fixation Device Description	(300A, 0196)	3	ST 1	User-defined description of Fixation Device.				
>>Fixation Device Position	(300A, 0198)	3	SH 1	Position/Notch number of Fixation Device.				
>>Accessory Code	(300A, 00F9)	3	LO 1	An identifier for the accessory intended to be read by a device such as a bar-code reader.				
>Shielding Device Sequence	(300A, 01A0)	3	SQ 1	Introduces sequence of Shielding Devices used in Patient Setup. One or more items may be included in this sequence.				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
>>Shielding Device Type	(300A, 01A2)	1C	CS 1	Type of Shielding Device used in Patient Setup. Defined Terms: GUM EYE GONAD Required if Shielding Device Sequence (300A,01A0) is sent.				
>>Shielding Device Label	(300A, 01A4)	2C	SH 1	User-defined label for Shielding Device. Required if Shielding Device Sequence (300A,01A0) is sent.				
>>Shielding Device Description	(300A, 01A6)	3	ST 1	User-defined description of Shielding Device.				
>>Shielding Device Position	(300A, 01A8)	3	SH 1	Position/Notch number of Shielding Device.				
>>Accessory Code	(300A, 00F9)	3	LO 1	An identifier for the accessory intended to be read by a device such as a bar-code reader.				
>Setup Technique	(300A, 01B0)	3	CS 1	Setup Technique used in Patient Setup. Defined Terms: ISOCENTRIC FIXED_SSD TBI BREAST_BRIDGE SKIN_APPOSITION				
>Setup Technique Description	(300A, 01B2)	3	ST 1	User-defined description of Setup.				
>Setup Device Sequence	(300A, 01B4)	3	SQ 1	Introduces sequence of devices used for patient alignment in Patient Setup. One or more items may be included in this sequence.				
>>Setup Device Type	(300A, 01B6)	1C	CS 1	Type of Setup Device used for Patient alignment. Defined Terms: LASER_POINTER DISTANCE_METER TABLE_HEIGHT MECHANICAL_PTR ARC Required if Setup Device Sequence (300A,01B4) is sent.				
>>Setup Device Label	(300A, 01B8)	2C	SH 1	User-defined label for Setup Device used for patient alignment. Required if Setup Device Sequence (300A,01B4) is sent.				
>>Setup Device Description	(300A, 01BA)	3	ST 1	User-defined description for Setup Device used for				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				patient alignment.				
>>Setup Device Parameter	(300A, 01BC)	2C	DS 1	Setup Parameter for Setup Device in appropriate IEC 61217 coordinate system. Units shall be mm for distances and angles for degrees. Required if Setup Device Sequence (300A,011B4) is sent.				
>>Setup Reference Description	(300A, 01D0)	3	ST 1	User-defined description of Setup Reference used for patient alignment.				
>Table Top Vertical Setup Displacement	(300A, 01D2)	3	DS 1	Vertical Displacement in IEC TABLE TOP coordinate system (in mm) relative to initial Setup Position, i.e. vertical offset between patient positioning performed using setup and treatment position.			RTT-PT	RT Ion Plan IOD: Read. Relative table offset. RT Ion Beams Treatment Record IOD: Written. Store the Vertical setup offsets that were delivered if any.
>Table Top Longitudinal Setup Displacement	(300A, 01D4)	3	DS 1	Longitudinal Displacement in IEC TABLE TOP coordinate system (in mm) relative to initial Setup Position, i.e. longitudinal offset between patient positioning performed using setup and treatment position.			RTT-PT	RT Ion Plan IOD: Read. Relative table offset. RT Ion Beams Treatment Record IOD: Written. Store the Longitudinal setup offsets that were delivered if any.
>Table Top Lateral Setup Displacement	(300A, 01D6)	3	DS 1	Lateral Displacement in IEC TABLE TOP coordinate system (in mm) relative to initial Setup Position, i.e. lateral offset between patient positioning performed using setup and treatment position.			RTT-PT	RT Ion Plan IOD: Read. Relative table offset. RT Ion Beams Treatment Record IOD: Written. Store the Lateral setup offsets that were delivered if any.

8.8.28 RT Prescription Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Private Extensions for this module can be found in "RT General									

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Plan::External Attributes"									
Prescription Description	(300A,000E)	3	ST 1	User-defined description of treatment prescription.				RTT-PT	Modified
Dose Type	(3004,0004)	3	CS 1	Type of dose. Defined Terms: PHYSICAL = physical dose (Absorbed dose) EFFECTIVE = physical dose after correction for biological effect using userdefined modeling technique ERROR = difference between desired and planned dose.	ERROR is unused here	EFFECTIVE	Used	RTT-PT	Read
Dose Reference Sequence	(300A,0010)	3	SQ 1	Introduces sequence of Dose References. One or more items may be included in this sequence.			Used	RTT-PT	Read
>Dose Reference Number	(300A,0012)	1C	IS 1	Identification number of the Dose Reference. The value of Dose Reference Number (300A,0012) shall be unique within the RT Plan in which it is created. Required if Dose Reference Sequence (300A, 0012) is sent.				RTT-PT	Read
>Dose Reference UID	(300A,0013)	3	UI 1	A unique identifier for a Dose Reference that can be used to link the same entity across multiple RT Plan objects.					
>Dose Reference Structure Type	(300A,0014)	1C	CS 1	Structure type of Dose Reference. Defined Terms: POINT dose reference point specified as ROI VOLUME dose reference volume specified as ROI COORDINATES point specified by Dose Reference Point Coordinates (300A,0018) SITE dose reference clinical site Required if Dose Reference Sequence					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				(300A,0010) is sent.					
>Dose Reference Description	(300A,0016)	3	LO 1	User-defined description of Dose Reference. Uniquely identifies the treatment site name. Used for Named Dose References.				RTT-PT	Read
>Referenced ROI Number	(3006,0084)	1C	IS 1	Uniquely identifies ROI representing the dose reference specified by ROI Number (3006,0022) in Structure Set ROI Sequence (3006,0020) in Structure Set Module within RT Structure Set in Referenced Structure Set Sequence (300C,0060) in RT General Plan Module. Required if Dose Reference Structure Type (300A,0014) is POINT or VOLUME and Dose Reference Sequence (300A,0010) is sent.					
>Referenced Target ROI Number	(300B,xx16)	3	IS 1	Uniquely identifies an additional target ROI representing the dose reference specified by ROI Number (3006,0022) in Structure Set ROI Sequence (3006,0020) in Structure Set Module within RT Structure Set in Referenced Structure Set Sequence (300C,0060) in RT General Plan Module. This additional target ROI shall be of RT ROI Interpreted Type (3006,00A4) PTV, CTV or GTV. Used if Dose Reference Structure Type (300A,0014) is POINT and Dose Reference Type (300A,0020) is TARGET to	In case of a dose reference of structure type POINT which references a target ROI of type POINT it is impossible to find the corresponding target ROI of type VOLUME the dose reference point refers to. Due to missing DICOM attributes the relationship between an ICRU dose reference point and a target volume is not supported. Although it can be argued that the reference should be				

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
				identify the referenced target volume.	established in the Structure Set IOD instance, it was decided to put it into the prescription. This allows to use 3rd party structure sets and establish the association between the dose reference point and the target volume nevertheless.				
>Dose Reference Point Coordinates	(300A,0018)	1C	DS 3	Coordinates (x, y, z) of Reference Point in the patient based coordinate system described in C76211 (mm). Required if Dose Reference Structure Type (300A,0014) is COORDINATES and Dose Reference Sequence (300A,0010) is sent.					
>Nominal Prior Dose	(300A,001A)	3	DS 1	Dose (in Gy) from prior treatment to this Dose Reference (e.g. from a previous course of treatment).				RTT-PT	Read
>Dose Reference Type	(300A,0020)	1C	CS 1	Type of Dose Reference. Required if Dose Reference Sequence (300A,0010) is sent. Defined Terms: TARGET treatment target (corresponding to GTV, PTV, or CTV in ICRU50) ORGAN_AT_RISK Organ at Risk (as defined in ICRU50)				RTT-PT	Read. Used to identify the type of dose referenc e.
>Constraint Weight	(300A,0021)	3	DS 1	Relative importance of satisfying constraint, where high values represent more important constraints.					
>Delivery Warning	(300A,0022)	3	DS 1	The dose (in Gy) which when reached or	This field shall contain the total plan			RTT-PT	Read

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
Dose				exceeded should cause some action to be taken.	dose, not the fraction dose.				
>Delivery Warning Dose Comment	(300B,xx11)	3	LT 1	Description of action to be taken when Delivery Warning Dose level is exceeded.				RTT-PT	Read
>Delivery Maximum Dose	(300A,0023)	3	DS 1	The maximum dose (in Gy) which can be delivered to the dose reference.	This field shall contain the total plan dose, not the fraction dose.			RTT-PT	Read. Dose limit that cannot be exceeded.
>Target Minimum Dose	(300A,0025)	3	DS 1	Minimum permitted dose (in Gy) to Dose Reference if Dose Reference Type (300A,0020) is TARGET.	This field shall contain the total plan dose, not the fraction dose.				
>Target Prescription Dose	(300A,0026)	3	DS 1	Prescribed dose (in Gy) to Dose Reference if Dose Reference Type (300A,0020) is TARGET.	This field shall contain the total plan dose, not the fraction dose.			RTT-PT	Read. Used as threshold for dose alert
> Target Prescription Dose Type	(300B,xx15)	3	CS1	Type of Target Prescription Dose (300A,0026) if Dose Reference Type (300A,0020) is TARGET and Dose Reference Structure Type (300A,0014) is VOLUME. It indicates how the Target Prescription Dose is to be interpreted in the referenced target volume. Defined Terms: MEAN MEDIAN					
>Target Maximum Dose	(300A,0027)	3	DS 1	Maximum permitted dose (in Gy) to Dose Reference if Dose Reference Type (300A,0020) is TARGET.	This field shall contain the total plan dose, not the fraction dose.			RTT-PT	Read
>Target Underdose Volume Fraction	(300A,0028)	3	DS 1	Maximum permitted fraction (in percent) of Target to receive less than the Target Prescription Dose if Dose Reference Type (300A,0020) is TARGET and Dose Reference Structure Type (300A,0014) is VOLUME.XSee Target Underdose Volume Fraction.					

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Example value	Attribute Checksum Relevance	Task	Task Usage
>Organ at Risk Full-volume Dose	(300A,002A)	3	DS 1	Maximum dose (in Gy) to entire Dose Reference if Dose Reference Type (300A,0020) is ORGAN_AT_RISK and Dose Reference Structure Type (300A,0014) is VOLUME.	This field shall contain the total plan dose, not the fraction dose.				
>Organ at Risk Limit Dose	(300A,002B)	3	DS 1	Maximum permitted dose (in Gy) to any part of Dose Reference if Dose Reference Type (300A,0020) is ORGAN_AT_RISK and Dose Reference Structure Type (300A,0014) is VOLUME.	This field shall contain the total plan dose, not the fraction dose.				
>Organ at Risk Maximum Dose	(300A,002C)	3	DS 1	Maximum dose (in Gy) to non-overdosed part of Dose Reference if Dose Reference Type (300A,0020) is ORGAN_AT_RISK and Dose Reference Structure Type (300A,0014) is VOLUME.	This field shall contain the plan dose, not the fraction dose.			RTT-PT	Read
>Organ at Risk Overdose Volume Fraction	(300A,002D)	3	DS 1	Maximum permitted fraction (in percent) of the Organ at Risk to receive more than the Organ at Risk Maximum Dose if Dose Reference Type (300A,0020) is ORGAN_AT_RISK and Dose Reference Structure Type (300A,0014) is VOLUME.					

8.8.29 RT ROI Observation Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Private Extensions for this module can be found in "Structure Set::syngo RT Private Data"						
RT ROI Observations Sequence	(3006,0080)	1	SQ,1	Introduces sequence of observations related to ROIs defined in the ROI Module. One or more items may be included in this sequence.		
>Observation Number	(3006,0082)	1	IS,1	Identification number of the Observation. The value of Observation Number (3006,0082) shall be unique within the RT ROI Observations Sequence (3006,0080).		
>Referenced ROI Number	(3006,0084)	1	IS,1	Uniquely identifies the referenced ROI		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				described in the Structure Set ROI Sequence (3006,0020).		
>ROI Observation Label	(3006,0085)	3	SH,1	User-defined label for ROI Observation.		
>ROI Observation Description	(3006,0088)	3	ST,1	User-defined description for ROI Observation.		
>RT Related ROI Sequence	(3006,0030)	3	SQ,1	Introduces sequence of significantly related ROIs, e.g. CTVs contained within a PTV. One or more items may be included in this sequence.		
>>Referenced ROI Number	(3006,0084)	1C	IS,1	Uniquely identifies the related ROI described in the Structure Set ROI Sequence (3006,0020). Required if RT Related ROI Sequence (3006,0030) is sent.		
>>RT ROI Relationship	(3006,0033)	3	CS,1	Relationship of referenced ROI with		
>RT ROI Identification Code Sequence	(3006,0086)	3	SQ,1	Introduces sequence containing Code used to identify ROI. If this sequence is included, only one item shall be present. Baseline Context ID Number = 96. See Section 53 for further explanation.		
>>>Include 'Code Sequence Macro'				>>Include 'Code Sequence Macro'		
>Related RT ROI Observations Sequence	(3006,00A0)	3	SQ,1	Introduces sequence of related ROI Observations. One or more items may be included in this sequence.		
>>Observation Number	(3006,0082)	1C	IS,1	Uniquely identifies a related ROI Observation. Required if Related RT ROI Observations Sequence (3006,00A0) is sent.		
>RT ROI Interpreted Type	(3006,00A4)	2	CS,1	Type of ROI. Defined Terms: * EXTERNAL = external patient contour * PTV = Planning Target Volume (as defined in ICRU50) * CTV = Clinical Target Volume (as defined in ICRU50) * GTV = Gross Tumor Volume (as defined in ICRU50) * TREATED_VOLUME = Treated Volume (as defined in ICRU50) * IRRAD_VOLUME = Irradiated Volume (as defined in ICRU50) * BOLUS = patient bolus to be used for external beam therapy * AVOIDANCE = region in which dose is to be minimized * ORGAN = patient organ * MARKER = patient marker or marker on localizer * REGISTRATION = registration ROI * ISOCENTER = treatment isocenter to be used for external beam therapy * CONTRAST_AGENT = volume into which a contrast agent has been injected * CAVITY = patient anatomical cavity * BRACHY_CHANNEL = brachytherapy channel * BRACHY_ACCESSORY = brachytherapy accessory device * BRACHY_SRC_APP = brachytherapy source applicator * BRACHY_CHNL_SHLD = brachytherapy channel shield * SUPPORT = external patient support device * FIXATION = external patient fixation		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				or immobilisation device * DOSE_REGION = ROI to be used as a dose reference * CONTROL = ROI to be used in control of dose optimization and calculation See RT ROI Interpreted Type.		
>ROI Interpreter	(3006,00A6)	2	PN,1	Name of person performing the interpretation.		
>Material ID	(300A,00E1)	3	SH,1	User-supplied identifier for ROI material.		
>ROI Physical Properties Sequence	(3006,00B0)	3	SQ,1	Introduces sequence describing physical properties associated with current ROI interpretation. One or more items may be included in this sequence.		
>>ROI Physical Property	(3006,00B2)	1C	CS,1	Physical property specified by ROI Physical Property Value (3006,00B4). Defined Terms: * REL_MASS_DENSITY = mass density relative to water * REL_ELEC_DENSITY = electron density relative to water * EFFECTIVE_Z = effective atomic number * EFF_Z_PER_A = ratio of effective atomic number to mass (AMU power -1) * REL_STOP_RATIO = linear stopping power ratio relative to water Required if ROI Physical Properties Sequence (3006,00B0) is sent.		
>>ROI Physical Property Value	(3006,00B4)	1C	DS,1	User-assigned value for physical property. Required if ROI Physical Properties Sequence (3006,00B0) is sent.		

8.8.30 RT Series Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Modality	(0008,0060)	1	CS 1	Type of equipment that originally acquired the data used to create the images in this Series.Enumerated Values:RTIMAGE=RT Image RTDOSE=RT Dose RTSTRUCT=RT Structure Set RTPLAN=RT Plan RTRECORD=RT Treatment Record The Enumerated Value for Modality (0008,0060) shall determined by the IOD:RTIMAGE if RT Image IOD, RTDOSE if RT Dose IOD, RTSTRUCT if RT Structure Set IOD, RTPLAN if RT Plan IOD. RTRECORD if RT Beams Treatment Record IOD, RT Brachy Treatment Record IOD, or RT Treatment Summary Record IOD. Note:DICOM specifies that a given series shall contain objects of only one Modality, and shall be created by a single device (described in the General Equipment Module). However, in general there may be many series defined for a given modality/device pair. Note that a radiotherapy series is generally created over an extended time interval (unlike in radiology, where all images in an image series are generally created together).	RTT-PT	Written
Series Instance UID	(0020,000E)	1	UI 1	Unique identifier of the Series.	RTT-PT	Modified
Series Number	(0020,0011)	2	IS 1	A number that identifies this Series.	RTT-PT	Written
Series Description	(0008,103E)	3	LO 1	User provided description of the Series.	RTT-PT	Written

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Referenced Performed Procedure Step Sequence	(0008,1111)	3	SQ 1	Uniquely identifies the Performed Procedure Step SOP Instance to which the Series is related (e.g. a Modality or General-Purpose Performed Procedure Step SOP Instance or Study Component SOP Instance). One or more items may be included in this sequence.		
>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced Performed Procedure Step Sequence (0008,1111) is sent.		
>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced Performed Procedure Step Sequence (0008,1111) is sent.		
Request Attributes Sequence	(0040,0275)	3	SQ 1	Sequence that contains attributes from the Imaging Service Request. The sequence may have one or more Items.		
>Requested Procedure ID	(0040,1001)	1C	SH 1	Identifier which identifies the Requested Procedure in the Imaging Service Request. Required if Sequence Item is present.		
>Scheduled Procedure Step ID	(0040,0009)	1C	SH 1	Identifier which identifies the Scheduled Procedure Step. Required if Sequence Item is present.		
>Scheduled Procedure Step Description	(0040,0007)	3	LO 1	Institution-generated description or classification of the Scheduled Procedure Step to be performed.		
>Scheduled Protocol Code Sequence	(0040,0008)	3	SQ 1	Sequence describing the Scheduled Protocol following a specific coding scheme. This sequence contains one or more Items.		
>>Include 'Code Sequence Macro'				No Baseline Context ID is defined.		
>>Protocol Context Sequence	(0040,0440)	3	SQ 1	Sequence that specifies the context for the Scheduled Protocol Code Sequence Item. One or more items may be included in this sequence.		
>>>Include 'Content Item Macro'				No Baseline Context ID is defined.		
>>>Content Item Modifier Sequence	(0040,0441)	3	SQ 1	Sequence that specifies modifiers for a Protocol Context Content Item. One or more items may be included in this sequence. See Module Scheduled Procedure Step in [].		
>>>>Include 'Content Item Macro'				No Baseline Context ID is defined.		
Performed Procedure Step ID	(0040,0253)	3	SH 1	User or equipment generated identifier of that part of a Procedure that has been carried out within this step.		
Performed Procedure Step Start Date	(0040,0244)	3	DA 1	Date on which the Performed Procedure Step started.		
Performed Procedure Step Start Time	(0040,0245)	3	TM 1	Time on which the Performed Procedure Step started.		
Performed Procedure Step Description	(0040,0254)	3	LO 1	Institution-generated description or classification of the Procedure Step that was performed.		
Performed Protocol Code Sequence	(0040,0260)	3	SQ 1	Sequence describing the Protocol performed for this Procedure Step. One or more Items may be included in this Sequence.		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
>Include 'Code Sequence Macro'				No Baseline Context ID is defined.		
>Protocol Context Sequence	(0040,0440)	3	SQ 1	Sequence that specifies the context for the Scheduled Protocol Code Sequence Item. One or more items may be included in this sequence.		
>>Include 'Content Item Macro'				No Baseline Context ID is defined.		
>>Content Item Modifier Sequence	(0040,0441)	3	SQ 1	Sequence that specifies modifiers for a Protocol Context Content Item. One or more items may be included in this sequence. See Module Scheduled Procedure Step in [].		
>>>Include 'Content Item Macro'				No Baseline Context ID is defined.		

8.8.31 RT Treatment Machine Record

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
Treatment Machine Sequence	(300A,0206)	1	SQ 1	Introduces sequence describing treatment machine used for treatment delivery. Only a single Item shall be permitted in this Sequence.		Used	RTT-PT	Written
>Treatment Machine Name	(300A,00B2)	2	SH 1	User-defined name identifying treatment machine used for treatment delivery.	See Treatment Machine Name in plan for more details and concepts.		RTT-PT	Written. Is the identifier of the used beamline
>Manufacturer	(0008,0070)	2	LO 1	Manufacturer of the equipment used for treatment delivery.			RTT-PT	Written. Copied from plan.
>Institution Name	(0008,0080)	2	LO 1	Institution where the equipment is located that was used for treatment delivery.			RTT-PT	Written. Copied from plan.
>Institution Address	(0008,0081)	3	ST 1	Mailing address of the institution where the equipment is located that was used for treatment delivery.			RTT-PT	Written. Copied from plan.
>Institutional Department Name	(0008,1040)	3	LO 1	Department in the institution where the equipment is located that was used for treatment delivery.			RTT-PT	Written. Copied from plan.
>Manufacture''s Model Name	(0008,1090)	2	LO 1	Manufacture''s model name of the equipment used for treatment delivery.	Wait for outcome of rebranding. This will clarify the model names for RTT-PT and TPS.		RTT-PT	Written. Copied from plan.
>Device Serial Number	(0018,1000)	2	LO 1	Manufacture''s serial number of the equipment			RTT-PT	Written. Copied from plan.

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Attribute Checksum Relevance	Task	Task Usage
				used for treatment delivery.				
> Treatment Room Name	(300B,xx33)	3	SH 1	Name of the treatment room in which treatment was performed			RTT-PT	Written

8.8.32 RT Treatment Summary Record

Attribute Name	Tag	Type	VR, VM	Description / Notes	Attribute Checksum Relevance	Task	Task Usage
Current Treatment Status	(3008,0200)	1	CS 1	Status of the Treatment at the time the Treatment Summary was created. Enumerated Values: NOT_STARTED ON_TREATMENT ON_BREAK SUSPENDED STOPPED COMPLETED	Used	RTT-PT	Tx FG: Written. Can only be ON_TREATMENT, STOPPED, COMPLETED. PosVerif group and Motion FG: Read
Treatment Status Comment	(3008,0202)	3	ST 1	Comment on current treatment status.	Used	RTT-PT	Tx FG: Written. Status comment is written when the record is created. PosVerif group :Written and Motion FG: Not Used
First Treatment Date	(3008,0054)	2	DA 1	Date of delivery of the first treatment.	Used	RTT-PT	Tx FG: Written PosVerif group and Motion FG: Not used
Most Recent Treatment Date	(3008,0056)	2	DA 1	Date of delivery of the most recent administration.	Used	RTT-PT	Tx FG: Written PosVerif group and Motion FG: Not used
Fraction Group Summary Sequence	(3008,0220)	3	SQ 1	Introduces sequence describing current state of planned vs. delivered fraction groups. The sequence may contain one or more items.	Used	RTT-PT	Tx FG: Written. Contains all the fraction groups that have been delivered since the beginning of the plan's treatment until now. PosVerif group and Motion FG: Written
>Referenced Fraction Group Number	(300C,0022)	3	IS 1	References Fraction Group Number (300A,0071) in Fraction Group Sequence (300A,0070) in the referenced RT Plan.		RTT-PT	Written
>Fraction Group Type	(3008,0224)	2C	CS 1	Indicates type of fraction group. Required if Fraction Group Summary Sequence (3008,0220) is sent. Enumerated Values: EXTERNAL_BEAM BRACHY		RTT-PT	Written. Always EXTERNAL_BEAM
>Number of Fractions	(300A,0078)	2C	IS 1	Number of fractions planned		RTT-PT	Tx FG: Written. The total number of fractions planned for this group. It is

Attribute Name	Tag	Type	VR, VM	Description / Notes	Attribute Checksum Relevance	Task	Task Usage
Planned				for this fraction group. Required if Fraction Group Summary Sequence (3008,0220) is sent.			identified from the fractionation plan in the fraction group. PosVerif group and Motion FG: Empty
>Number of Fractions Delivered	(3008,005A)	2C	IS 1	Number of fractions delivered as of Treatment Summary Report. Required if Fraction Group Summary Sequence (3008,0220) is sent.		RTT-PT	Tx FG: Written. Total number of fractions that have been delivered until now for this fraction group. PosVerif group and Motion FG: Empty
>Fraction Status Summary Sequence	(3008,0240)	3	SQ 1	Introduces sequence describing status of fractions in Fraction Group. The sequence may contain one or more items.		RTT-PT	Written. Contains all the fractions of this fraction group that have been delivered as part of this plan until now.
>>Referenced Fraction Number	(3008,0223)	1C	IS 1	Identifies fraction. Required if Fraction Status Summary Sequence (3008,0240) is sent.		RTT-PT	Modified
>>Treatment Date	(3008,0250)	2C	DA 1	Date when fraction was delivered. Required if Fraction Status Summary Sequence (3008,0240) is sent.		RTT-PT	Written
>>Treatment Time	(3008,0251)	2C	TM 1	Time when fraction was delivered. Required if Fraction Status Summary Sequence (3008,0240) is sent.		RTT-PT	Written
>>Treatment Termination Status	(3008,002A)	2C	CS 1	Conditions under which treatment was terminated. Required if Fraction Status Summary Sequence (3008,0240) is sent. Enumerated Values: NORMAL treatment terminated normally OPERATOR operator terminated treatment MACHINE machine terminated		RTT-PT	Tx FG: Written. Used for identification of incomplete/aborted treatment sessions. PosVerif group and Motion FG: Written

Attribute Name	Tag	Type	VR, VM	Description / Notes	Attribute Checksum Relevance	Task	Task Usage
				treatment for other than NORMAL condition UNKNOWN status at termination unknown			
>>Fraction Delivery Notes	(300B,xx66)	3	LT 1	Free text for fraction treatment delivery notes.		RTT-PT	Tx FG: Written PosVerif group and Motion FG: Not used
Treatment Summary Calculated Dose Reference Sequence	(3008,0050)	3	SQ 1	Introduces sequence of references to Calculated Dose References. The sequence may contain one or more items.	Used	RTT-PT	Tx FG: Written, if the plan type is not PLANVERIFICATION. Otherwise not used. PosVerif group and Motion FG: Not used
>Referenced Dose Reference Number	(300C,0051)	3	IS 1	Uniquely identifies Dose Reference specified by Dose Reference Number (300A,0012) in Dose Reference Sequence (300A,0010) in RT Prescription Module of referenced RT Plan referenced in Referenced RT Plan Sequence (300C,0002) of RT General Treatment Record Module.		RTT-PT	Tx FG: Written PosVerif group and Motion FG: Not used
>Dose Reference Description	(300A,0016)	3	LO 1	User-defined description of Dose Reference.		RTT-PT	Tx FG: Written. This value is copied from the Dose reference description attribute of the corresponding dose reference in the RT prescription module. PosVerif group and Motion FG: Not used
>Cumulative Dose to Dose Reference	(3008,0052)	1C	DS 1	Cumulative Dose delivered to Dose Reference (Gy). Required if Treatment Summary Dose Reference Sequence (3008,0050) is sent.		RTT-PT	Tx FG: Written PosVerif group and Motion FG: Not used
Treatment Summary Measured Dose Reference Sequence	(3008,00E0)	3	SQ 1	Introduces sequence of references to Measured Dose References. The sequence may contain one or more items.			
>Referenced Dose Reference Number	(300C,0051)	3	IS 1	Uniquely identifies Dose Reference specified by Dose Reference Number (300A,0012) in Dose Reference Sequence (300A,0010) in RT Prescription			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Attribute Checksum Relevance	Task	Task Usage
				Module of referenced RT Plan referenced in Referenced RT Plan Sequence (300C,0002) of RT General Treatment Record Module.			
>Dose Reference Description	(300A,0016)	3	LO 1	User-defined description of Dose Reference.			
>Cumulative Dose to Dose Reference	(3008,0052)	1C	DS 1	Cumulative Dose delivered to Dose Reference (Gy). Required if Treatment Summary Dose Reference Sequence (3008,0050) is sent.			

8.8.33 SC Image Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Date of Secondary Capture	(0018,1012)	3	DA,1	The date the Secondary Capture Image was captured.		
Time of Secondary Capture	(0018,1014)	3	TM,1	The time the Secondary Capture Image was captured.		
Nominal Scanned Pixel Spacing	(0018,2010)	3	DS,2	Physical distance on the media being digitized or scanned between the center of each pixel, specified by a numeric pair -adjacent row spacing (delimiter) adjacent column spacing in mm. Shall be consistent with Pixel Aspect Ratio (0028,0034), if present.		
Include Basic Pixel Spacing Calibration Macro (Table 10-10)						

8.8.34 Spatial Registration Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Private Extensions for this module can be found in "Spatial Registration::syngo RT Private Data"							
Content Date	(0008,0023)	1	DA 1	The date the content creation started.			
Content Time	(0008,0033)	1	TM 1	The time the content creation started.			
Instance Number	(0020,0013)	1	IS 1	A number that identifies this instance			
Content Label	(0070,0080)	1	CS 1	A label that is used to identify this registration.			
Content Description	(0070,0081)	2	LO 1	A description of this registration.			
Content Creator's Name	(0070,0084)	2	PN 1	Name of operator performing the registration (such as a technologist or physician).			
Registration Sequence	(0070,0308)	1	SQ 1	A sequence of one or more registration items. Each item defines a spatial registration to the referenced images in that item. All referenced images are in the same			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				spatial frame of reference or atlas.			
>Frame of Reference UID	(0020,0052)	1C	UI 1	Identifies a Frame of Reference that may or may not be an image set (e.g. atlas or physical space). See PS 3.3 C.7.4.1.1.1 for further explanation. Required if Referenced Image Sequence (0008,1140) is absent. May be present otherwise.	Is this attribute or the same attribute in the "Frame of Reference Module" of "Spatial Registration IOD" used??		
>Referenced Image Sequence	(0008,1140)	1C	SQ 1	Identifies the set of images registered in this sequence item. One or more items shall be present. Required if Frame of Reference UID (0020,0052) is absent. May be present otherwise.			
>>Include 'Image SOP Instance Reference Macro'							
>Matrix Registration Sequence	(0070,0309)	1	SQ 1	A sequence that specifies one spatial registration. Exactly one item shall be present			
>>Frame of Reference Transformation Comment	(3006,00C8)	3	LO 1	User description or comments about the registration.			
>>Registration Type Code Sequence	(0070,030D)	2	SQ 1	Describes the information input into the registration process. Only one item may be present.			
>>>Include ‘Code Sequence Macro’ Table 8.8-1				Baseline Context ID is 7100			
>>Matrix Sequence	(0070,030A)	1	SQ 1	One or more items shall be present. Each item specifies a transformation. The item order is significant and corresponds to matrix multiplication order. See PS 3.3 C.20.2.1.1.			
>>>Frame of Reference Transformation Matrix	(3006,00C6)	1	DS 16	A 4x4 homogeneous transformation matrix that registers the referenced images to the local RCS. Matrix elements shall be listed in row-major order. See PS 3.3 C.20.2.1.1.	Note that DICOM stores the transformation matrix as Model-> Reference		
>>>Frame of Reference Transformation Matrix Type	(0070,030C)	1	CS 1	Type of Frame of Reference Transformation Matrix (3006,00C6). Defined terms: RIGID RIGID_SCALE AFFINE RIGID_PROJECTIVE See PS 3.3 C.20.2.1.2			
>Used Fiducials Sequence	(0070,0314)	3	SQ 1	The fiducials used to determine the Frame of Reference Transformation Matrix. One or more Items may be present.			
>>Include 'SOP Instance Reference Macro'				Reference to the Spatial Fiducial SOP Instance identifying the Used Fiducial(s)			
>>Fiducial UID	(0070,031A)	1	UI 1	The UID that identifies the fiducial used as registration input.			
Referenced Siemens Non Image Sequence	(300B,xx18)	3	SQ 1	References the instance of the Siemens Non Image IOD which mirrors this Spatial Registration IOD instance into the syngo Classic world. At most one item shall be present in the sequence.	For details of this mapping, please refer to ClearCase:/DOCS/SWDS/ArcH&Comps/TxSessionData/SiemensNonImageIODSpatialRegistrationIODMappin		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
					g.xls. Note that this private data is not implemented in the XML based attribute below in order to allow infrastructural components to follow the reference without having to parse the XML data.		
>Include 'SOP Instance Reference Macro'							
syngo RT Private Data	(300B,xx17)	3	UT 1	This tag contains private data for a Spatial Registration IOD as an instance of SpatialRegistrationExtensions.xsd			

8.8.35 Spatial Fiducials Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Content Date	(0008,0023)	1	DA 1	The date the content creation started.		
Content Time	(0008,0033)	1	TM 1	The time the content creation started.		
Instance Number	(0020,0013)	1	IS 1	A number that identifies this instance		
Content Label	(0070,0080)	1	CS 1	A label that is used to identify this registration		
Content Description	(0070,0081)	2	LO 1	A description of this registration.		
Content Creator's Name	(0070,0084)	2	PN 1	Name of operator performing the registration (such as a technologist or physician).		
Fiducial Set Sequence	(0070,031C)	1	SQ 1	A sequence of one or more items, each of which is a fiducial set.		
>Frame of Reference UID	(0020,0052)	1C	UI 1	Identifies a Frame of Reference that may or may not be an image set (e.g. an atlas or physical space). See PS 3.3 C.7.4.1.1.1 for further explanation. Required if Referenced Image Sequence (0008,1140) is absent. May be present otherwise.		
>Referenced Image Sequence	(0008,1140)	1C	SQ 1	Identifies the set of images in which the fiducials are located. Required if Frame of Reference UID (0020,0052) is absent. May be present otherwise. One or more Items shall be present. All referenced images shall have the same Frame of Reference UID if present in the images.		
>>Include 'Image SOP Instance Reference Macro'						
>Fiducial Sequence	(0070,031E)	1	SQ 1	A sequence that specifies one or more fiducials, one item per fiducial.		
>>Fiducial Identifier	(0070,0310)	1	SH 1	A fiducial assignment identifier that is unique within this Fiducial Sequence item but may match the fiducial identifier of an equivalent feature in another item.		
>>Fiducial Identifier Code Sequence	(0070,0311)	1C	SQ 1	A code sequence for a term that identifies a well-known fiducial type (potentially including methodology, anatomy, tools, etc.). Only one item shall be present. Required if Identifier (0070,0310) is absent. May be present otherwise.		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
>>>Include 'Code Sequence Macro' Table 8.8-1						
>>Fiducial UID	(0070,031A)	3	UI 1	Globally unique identifier for the fiducial instance of this fiducial assignment.		
>>Fiducial Description	(0070,030F)	3	ST 1	User description or comments about the fiducial.		
>>Shape Type	(0070,0306)	1	CS 1	Shape Type (0070,0306) defines the geometric interpretation of the Contour Data (3006,0050) and Graphic Data (0070,0022). A point is defined as a triplet (x,y,z) in the case of spatial data or a pair (x,y) in the case of graphic data. Defined Terms are: POINT = a single point designating a single fiducial point. Note: A point may be the epicenter of a more complex shape such as sphere. LINE = two points that specify a line or axis such as the inter-orbital line. The point locations have no significance other than identifying the line, i.e. they are not line segment end points. PLANE = three points that identify a plane such as the laterality plane SURFACE = three or more points (usually many) that reside on, or near, a region of a curved surface. The surface may be flat or curved, closed or open. The point order has no significance. RULER = two or more evenly spaced collinear points ordered sequentially along the line, such as a physical ruler placed in the imaging field. L_SHAPE = three points of two perpendicular line segments, AB and BC, having a common end point B. The order of the points is: ABC. May represent an L-shaped marker placed in the imaging field. T_SHAPE = three points of two perpendicular line segments AB and CD, such that C bisects AB. The order is ABD. SHAPE = three or more points that specify the shape of a well-known fiducial type. The term in the Fiducial Identifier Code Sequence (0070,0311) defines the shape and the order of the points that represent it.		
>>Number of Contour Points	(3006,0046)	1C	IS 1	Number of points (triplets) in Contour Data (3006,0050). Required if Contour Data is present.		
>>Contour Data	(3006,0050)	1C	DS 3-3n	Specifies the coordinates of this item's fiducial. One triplet (x,y,z) shall be present for each point in the fiducial. See PS 3.3 C.21.2.1.2 for further explanation. Required if Frame of Reference UID (0020,0052) is present in this item of the Fiducial Set Sequence (0070,031C). Shall not be present otherwise. Note: Contour Data may not be properly encoded if Explicit-VR transfer syntax is used and the VL of this attribute exceeds 65534 bytes. Contour Data (3006,0050) is an ordered set of triplets that defines a shape. The triplets (x,y,z) denote points in the Reference Coordinate		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				System of the Registration Instance. Note: Contours may associate observational data with a set of Image features or specify coordinates that are input data for a measurement.		
>>Contour Uncertainty Radius	(0070,0312)	3	FD 1	The uncertainty is an estimate of the standard deviation of the fiducial location process.		
>>Graphic Coordinates Data Sequence	(0070,0318)	1C	SQ 1	The image pixel locations of the fiducial's points. Shall contain one or more items. More than one item shall be present only if a fiducial spans more than one image. Required if Contour Data is not present. May be present otherwise.		
>>>Graphic Data	(0070,0022)	1	FL 2-n	Graphic point coordinates of the fiducial points in the image of the Referenced Image Sequence. If Fiducial's Contour Data (3006,0050) is present, these points correlate to the points in the Contour Data, one row-column pair for each point and in the same order. See PS 3.3 C.10.5.1.2 for further explanation.		
>>>Referenced Image Sequence	(0008,1140)	1	SQ 1	A sequence that specifies the image containing the fiducial's graphic coordinates. Only one item shall be present. Shall be an image within the set of the images in the Referenced Image Sequence (0008,1140) of the encapsulating Fiducial Set Sequence (0070,031C) item.		
>>>>Include 'Image SOP Instance Reference Macro'						

8.8.36 SR Document Content

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Include Document Content Macro Table PS 3.3 C.17-5. with a Value Type (0040,A040) of CONTAINER						
Include Document Relationship Macro Table PS 3.3 C.17-6.						
syngo Report Data	(0029,xx10)	3	OB,1	Used by syngo Classic to store SR content, as syngo Classic does not support the standard SR Document Content Module.	RTT-PT	Written. Contains "Plan Action Status" object as an XML string. This is compatible to what RTT-syngo does. The format is specified in RTPlanActionStatus.xsd

8.8.37 SR Document General

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Instance Number	(0020,0013)	1	IS 1	A number that identifies the SR Document.		RTT-PT	Written
Completion Flag	(0040,A491)	1	CS 1	The estimated degree of completeness of this SR Document with respect to externally defined criteria in a manner specified in the Conformance Statement.Note: It may be desirable to make thesecriteria adaptable to local policies or user decisions. Enumerated Values: PARTIAL Partial content. COMPLETE Complete content.		RTT-PT	Written

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Completion Flag Description	(0040,A492)	3	LO 1	Explanation of the value sent in Completion Flag (0040,A491).		RTT-PT	Written
Verification Flag	(0040,A493)	1	CS 1	Indicates whether this SR Document is Verified. Enumerated Values: UNVERIFIED Not attested to. VERIFIED Attested to by a Verifying Observer Name (0040,A075) who is accountable for its content. Note: The intent of this specification is that the“"prevailing final versio”" of an SR Document is the version having the most recent Verification DateTime (0040,A030), Completion Flag (0040,A491) of COMPLETE and Verification Flag (0040,A493) of VERIFIED.		RTT-PT	Written
Content Date	(0008,0023)	1	DA 1	The date the document content creation started.		RTT-PT	Written
Content Time	(0008,0033)	1	TM 1	The time the document content creation started.		RTT-PT	Written
Verifying Observer Sequence	(0040,A073)	1C	SQ 1	The person or persons authorized to verify documents of this type and accept responsibility for the content of this document. One or more Items may be included in this sequence. Required if Verification Flag (0040,A493) is VERIFIED.			
>Verifying Observer Name	(0040,A075)	1	PN 1	The person authorized by the Verifying Organization (0040,A027) to verify documents of this type and who accepts responsibility for the content of this document		RTT-PT	Written
>Verifying Observer Identification Code Sequence	(0040,A088)	2	SQ 1	Identification Code Sequence Coded identifier of Verifying Observer. Zero or one Items shall be permitted in this sequence.		RTT-PT	Written
>>Include 'Code Sequence Macro'							
>Verifying Organization	(0040,A027)	1	LO 1	Organization to which the Verifying Observer Name (0040,A075) is accountable for this document in the current interpretation procedure.		RTT-PT	Written
>Verification DateTime	(0040,A030)	1	DT 1	Date and Time of verification by the Verifying Observer Name (0040,A075).		RTT-PT	Written
Predecessor Documents Sequence	(0040,A360)	1C	SQ 1	Shall refer to SR SOP Instances (for example prior or provisional reports) whose content has been wholly or partially included in this document with or without modification. One or more Items may be included in this sequence. Required if this document includes content from other documents. Note: The amendment process of an existing SR Document is not explicitly described, but several approaches may be considered; one may choose, for example, to create a new SR Document that includes the original content with any amendments applied or included; the structure of this amended SR Document may or	This attribute is used for maintaining the versioning relationship between structure sets in the syngo RT context. Note that branching version chains is technically possible using this attribute, but it is forbidden in syngo RT.		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
				may not reflect what was amended; however, the use of the Predecessor Document Sequence allows tracing back to the input SR Document, which in this case is the previous version.			
>Include 'SOP Instance Reference Macro'							
Identical Documents Sequence	(0040,A525)	1C	SQ 1	Duplicates of this document, stored with different SOP Instance UIDs. One or more Items may be included in this sequence. Required if this document is stored with different SOP Instance UIDs in one or more other Studies. See Identical Documents Sequence for further explanation.			
>Include 'SOP Instance Reference Macro'							
Referenced Request Sequence	(0040,A370)	1C	SQ 1	Identifies Requested Procedures which are being fulfilled (completely or partially) by creation of this Document.XOne or more Items may be included in this sequence.XRequired if this Document fulfills at least one Requested Procedure.			
>Study Instance UID	(0020,000D)	1	UI 1	Unique identifier for the Study.			
>Referenced Study Sequence	(0008,1110)	2	SQ 1	Uniquely identifies the Study SOP Instance. Only a single Item shall be permitted in this sequence.			
>>Referenced SOP Class UID	(0008,1150)	1	UI 1	Uniquely identifies the SOP Class.			
>>Referenced SOP Instance UID	(0008,1155)	1	UI 1	Uniquely identifies the SOP Instance.			
>Accession Number	(0008,0050)	2	SH 1	A departmental IS generated number which identifies the order for the Study.			
>Placer Order Number/Imaging Service Request	(0040,2016)	2	LO 1	The order number assigned to the Imaging Service Request by the party placing the order.			
>Filler Order Number/Imaging Service Request	(0040,2017)	2	LO 1	The order number assigned to the Imaging Service Request by the party filling the order.			
>Requested Procedure ID	(0040,1001)	2	SH 1	Identifier of the related Requested Procedure.			
>Requested Procedure Description	(0032,1060)	2	LO 1	Institution-generated administrative description or classification of Requested Procedure.			
>Requested Procedure Code Sequence	(0032,1064)	2	SQ 1	A sequence that conveys the requested procedure. Zero or one Item may be included in this sequence.			
>>Include 'Code Sequence Macro'				No Baseline Context ID Number is specified.			
>Reason for the Requested Procedure	(0040,1002)	3	LO 1	Reason for requesting this imaging procedure.			
>Reason for Requested Procedure Code Sequence	(0040,100A)	3	SQ 1	Coded Reason for requesting this procedure.			
>>Include 'Code Sequence Macro'				No Baseline Context ID is defined.			
Performed Procedure Code Sequence	(0040,A372)	2	SQ 1	A Sequence that conveys the codes of the performed procedures pertaining to this SOP Instance. Zero or more Items may be included in this sequence.			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
>>Include 'Code Sequence Macro'				No Baseline Context ID Number is specified.			
Current Requested Procedure Evidence Sequence	(0040,A375)	1C	SQ 1	Full set of Composite SOP Instances created to satisfy the current Requested Procedure(s) for which this SR Document is generated. One or more Items may be included in this sequence. Required if Composite Objects were acquired in order to satisfy the Requested Procedure(s) for which the SR Document is generated. See Current Requested Procedure Evidence Sequence and Pertinent Other Evidence Sequence for further explanation.			
>Include 'SOP Instance Reference Macro'							
Pertinent Other Evidence Sequence	(0040,A385)	1C	SQ 1	Other Composite SOP Instances that are considered to be pertinent evidence by the creator of this SR Document. This evidence must have been acquired in order to satisfy Requested Procedures other than the one(s) for which this SR Document is generated. One or more Items may be included in this sequence. Required if pertinent evidence from other Requested Procedures needs to be recorded and and Completion Flag (0040,A491) value is COMPLETE. May be present otherwise. See Current Requested Procedure Evidence Sequence and Pertinent Other Evidence Sequence for further explanation.			
>Include 'SOP Instance Reference Macro'							

8.8.38 SR Document Series Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Modality	(0008,0060)	1	CS 1	Modality type. Enumerated Values: SR SR Document	RTT-PT	Modified
Series Instance UID	(0020,000E)	1	UI 1	Unique identifier of the Series. Note: No SR-specific semantics are specified.	RTT-PT	Modified
Series Number	(0020,0011)	1	IS 1	A number that identifies the Series. Note: No SR-specific semantics are specified.	RTT-PT	Modified
Referenced Performed Procedure Step Sequence	(0008,1111)	2	SQ 1	Uniquely identifies the Performed Procedure Step SOP Instance for which the Series is created. Only a single Item shall be permitted in this sequence. Notes: 1. The Performed Procedure Step referred to by this Attribute is the Step during which this Document is generated. 2. If this Document is generated during the same Modality or General-Purpose Performed Procedure Step as the evidence in the current interpretation		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
				procedure, this attribute may contain reference to that Modality or General-Purpose Performed Procedure Step. 3. This Attribute is not used to convey reference to the evidence in the current interpretation procedure; see Current Requested Procedure Evidence Sequence (0040,A375). 4. This Sequence may be sent zero length if the Performed Procedure Step is unknown.		
>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if Referenced Performed Procedure Step Sequence (0008,1111) is sent.		
>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if Referenced Performed Procedure Step Sequence (0008,1111) is sent.		

8.8.39 Structure Set Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Private Extensions for this module can be found in "Structure Set::syngo RT Private Data"							
Structure Set Label	(3006,0002)	1	SH 1	User-defined label for Structure Set.			
Structure Set Name	(3006,0004)	3	LO 1	User-defined name for Structure Set.			
Structure Set Description	(3006,0006)	3	ST 1	User-defined description for Structure Set.			
Instance Number	(0020,0013)	3	IS 1	A number that identifies this object instance.			
Structure Set Date	(3006,0008)	2	DA 1	Date at which Structure Set was last modified.			
Structure Set Time	(3006,0009)	2	TM 1	Time at which Structure Set was last modified.			
Structure Set Predecessor	(0039,xx76)	3	LO 1	SOP instance UID of predecessor version of this structure set.	This attribute is used for maintaining the versioning relationship between structure sets in the syngo RT context. Note that branching version chains is technically possible using this attribute, but it is forbidden in syngo RT.		
Referenced Frame of Reference Sequence	(3006,0010)	3	SQ 1	Introduces sequence of items describing Frames of Reference in which the ROIs are defined. One or more items may be included in this sequence. See PS 3.3 C.8.8.5.1.			
>Frame of Reference UID	(0020,0052)	1C	UI 1	Uniquely identifies Frame of Reference within Structure Set. Required if Referenced Frame of Reference Sequence (3006,0010) is sent.			
>Frame of Reference	(3006,00C0)	3	SQ 1	Introduces sequence of transforms that relate other			

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Relationship Sequence				Frames of Reference to this Frame of Reference.			
>>Related Frame of Reference UID	(3006,00C2)	1C	UI 1	Frame of Reference Coordinate System to be transformed to the current Frame of Reference. Required if Frame of Reference Relationship Sequence (3006,00C0) is sent.			
>>Frame of Reference Transformation Type	(3006,00C4)	1C	CS 1	Type of Transformation. Required if Frame of Reference Relationship Sequence (3006,00C0) is sent. Defined Terms: HOMOGENEOUS			
>>Frame of Reference Transformation Matrix	(3006,00C6)	1C	DS 16	Four-by-four transformation Matrix from Related Frame of Reference to current Frame of Reference. Matrix elements shall be listed in row-major order. Required if Frame of Reference Relationship Sequence (3006,00C0) is sent. See PS 3.3 C.8.8.5.2.			
>>Frame of Reference Transformation Comment	(3006,00C8)	3	LO 1	Comment regarding the transformation between the related and current Frames of Reference			
>RT Referenced Study Sequence	(3006,0012)	3	SQ 1	Introduces sequence of Studies containing series to be referenced. One or more items may be included in this sequence.			
>>Referenced SOP Class UID	(0008,1150)	1C	UI 1	Uniquely identifies the referenced SOP Class. Required if RT Referenced Study Sequence (3006,0012) is sent.			
>>Referenced SOP Instance UID	(0008,1155)	1C	UI 1	Uniquely identifies the referenced SOP Instance. Required if RT Referenced Study Sequence (3006,0012) is sent.			
>>RT Referenced Series Sequence	(3006,0014)	1C	SQ 1	Introduces sequence of items describing series of images within the referenced study which are used in defining the Structure Set. Required if RT Referenced Study Sequence (3006,0012) is sent. One or more items may be included in this sequence.			
>>>Series Instance UID	(0020,000E)	1C	UI 1	Unique identifier for the series containing the images. Required if RT Referenced Series Sequence (3006,0014) is sent.			
>>>Contour Image Sequence	(3006,0016)	1C	SQ 1	Introduces sequence of items describing images in a given series used in defining the Structure Set (typically CT or MR images). Required if RT Referenced Series Sequence (3006,0014) is sent. One or more items may be included in this sequence.			
>>>>Include 'Image SOP Instance Reference Macro'							

Attribute Name	Tag	Type	VR, VM	Description / Notes	Comment	Task	Task Usage
Structure Set ROI Sequence	(3006,0020)	3	SQ 1	Introduces sequence of ROIs for current Structure Set. One or more items may be included in this sequence.			
>ROI Number	(3006,0022)	1C	IS 1	Identification number of the ROI. The value of ROI Number (3006,0022) shall be unique within the Structure Set in which it is created. Required if Structure Set ROI Sequence (3006,0020) is sent.			
>Referenced Frame of Reference UID	(3006,0024)	1C	UI 1	Uniquely identifies Frame of Reference in which ROI is defined, specified by Frame of Reference UID (0020,0052) in Referenced Frame of Reference Sequence (3006,0010). Required if Structure Set ROI Sequence (3006,0020) is sent.			
>ROI Name	(3006,0026)	2C	LO 1	User-defined name for ROI. Required if Structure Set ROI Sequence (3006,0020) is sent.			
>ROI Description	(3006,0028)	3	ST 1	User-defined description for ROI.			
>ROI Volume	(3006,002C)	3	DS 1	Volume of ROI (cubic centimeters).			
>ROI Generation Algorithm	(3006,0036)	2C	CS 1	Type of algorithm used to generate ROI. Required if Structure Set ROI Sequence (3006,0020) is sent. Defined Terms: AUTOMATIC = calculated ROI SEMIAUTOMATIC = ROI calculated with user assistance MANUAL = user-entered ROI			
>ROI Generation Description	(3006,0038)	3	LO 1	User-defined description of technique used to generate ROI.			
syngo RT Private Data	(300B,xx17)	3	UT 1	This tag contains private data for a Structure Set IOD as an instance of RTStructureSetExtensions.xsd			

8.8.40 X-Ray Acquisition Module

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
KVP	(0018,0060)	2	DS, 1	Peak kilo voltage output of the X-Ray generator used.		
Radiation Setting	(0018,1155)	1	CS, 1	Identify the general level of X-Ray dose exposure. Enumerated values are: SC = low dose exposure generally corresponding to fluoroscopic settings (e.g. preparation for diagnostic quality image acquisition); GR = high dose for diagnostic quality image		
X-Ray Tube Current	(0018,1151)	2C	IS, 1	X-Ray Tube Current in mA. Required if Exposure (0018,1152) is not present.		
X-Ray Tube Current in µA	(0018,8151)	3	DS, 1	X-Ray Tube Current in µA.		
Exposure Time	(0018,1150)	2C	IS, 1	Duration of X-Ray exposure in msec. See 8.7.2.1.1. Required if Exposure (0018,1152) is not present.		

Attribute Name	Tag	Type	VR, VM	Description / Notes	Task	Task Usage
Exposure Time in µS	(0018,8150)	3	DS, 1	Duration of X-Ray exposure in µsec.		
Exposure	(0018,1152)	2C	IS, 1	The exposure expressed in mAs, for example calculated from Exposure Time and X-ray Tube Current. Required if either Exposure Time (0018,1150) or X-Ray Tube Current (0018,1151) are not present.		
Exposure in µAs	(0018,1153)	3	IS, 1	The exposure expressed in µAs, for example calculated from Exposure Time and X-ray Tube Current.		
Grid	(0018,1166)	3	CS, 1-n	Identify the grid. Only a single value shall be present. Defined Terms are: IN = A Grid is positioned; NONE = No Grid is used.		
Average Pulse Width	(0018,1154)	3	DS, 1	Average width of X-Ray pulse in msec.		
Radiation Mode	(0018,115A)	3	CS, 1	Specifies X-Ray radiation mode. Defined Terms: CONTINUOUS PULSED		
Type of Filters	(0018,1161)	3	LO, 1-n	Type of filter(s) inserted into the X-Ray beam (e.g. wedges).		
Intensifier Size	(0018,1162)	3	DS, 1	Diameter of X-Ray intensifier in mm		
Field of View Shape	(0018,1147)	3	CS, 1	Shape of the Image Intensifier Field of View. See PS 3.3 C.8.7.2.1.2. Defined Terms are: ROUND RECTANGLE		
Field of View Dimension(s)	(0018,1149)	3	IS, 1-2	Dimensions of the Image Intensifier Field of View in mm. If Rectangle, row dimension followed by column; if Round, diameter.		
Imager Pixel Spacing	(0018,1164)	3	DS, 2	Physical distance measured at the front plane of the Image Receptor housing between the center of each pixel specified by a numeric pair - row spacing value(delimiter) column spacing value in mm. The value of this attribute shall never be adjusted to account for correction for the effect of geometric magnification or calibration against an object of known size; Pixel Spacing (0028,0030) is specified for that purpose.		
>Include Basic Pixel Spacing Calibration Macro						
Focal Spot	(0018,1190)	3	DS, 1-n	Nominal focal spot size in mm used to acquire this image.		
Image and Fluoroscopy Area Dose Product	(0018,115E)	3	DS, 1	X-Ray dose, measured in dGy*cm*cm, to which the patient was exposed for the acquisition of this image plus any nondigitally recorded fluoroscopy which may have been performed to prepare for the acquisition of this image. Note: The sum of the area dose product of all images of a Series or a Study may not result in the total area dose product to which the patient was exposed.		
Source To Isocenter	(0021,xx17)	3	SL, 1	X-Ray source to isocenter distance in mm.	RTT-PT	Read

8.9 General

8.9.1 Private Creator Codes

Attribute Name	Tag	Type	VR, VM	Comment	Task	Task Usage
SIEMENS MED SYNGO RT	(300B,00XX)	1	LO, 1	Creator code for private attributes		

Attribute Name	Tag	Type	VR, VM	Comment	Task	Task Usage
				defined for syngo RT in context of PT-RTT and PT-TPS. Specifies that all private attributes based on this code have a tag in the following format: (300B,XXyy)		
SIEMENS MED OCS BEAM DISPLAY INFO	(0039,00XX)	1	LO, 1	Creator code for the Beam Display Info private attribute defined in the RT General Plan Module.		
SIEMENS MED OCS SS VERSION INFO	(0039,00XX)	1	LO, 1	Creator code for structure set versioning.		
SIEMENS MED OCS SS DISPLAY INFO	(0039,00XX)	1	LO, 1	Creator code for private structure set display attributes.		
SIEMENS CSA ENVELOPE	(0029,00XX)	1	LO, 1	Creator code from syngo classic.		
SIEMENS CSA NON-IMAGE	(0029,00XX)	1	LO, 1	Creator code for CSA Non Images of syngo classic.		
SIEMENS MED OCS PUBLIC RT PLAN ATTRIBUTES	(0039,00XX)	1	LO, 1	Creator code for XML instance with private content in RT General Plan		
SIEMENS SMS-AX ACQ 1.0	(0021,00XX)	1	LO, 1	Creator code for X-RAY acquisition module of AX.		

8.10 SRs with Special Meaning

8.10.1 Fraction Sequence SR

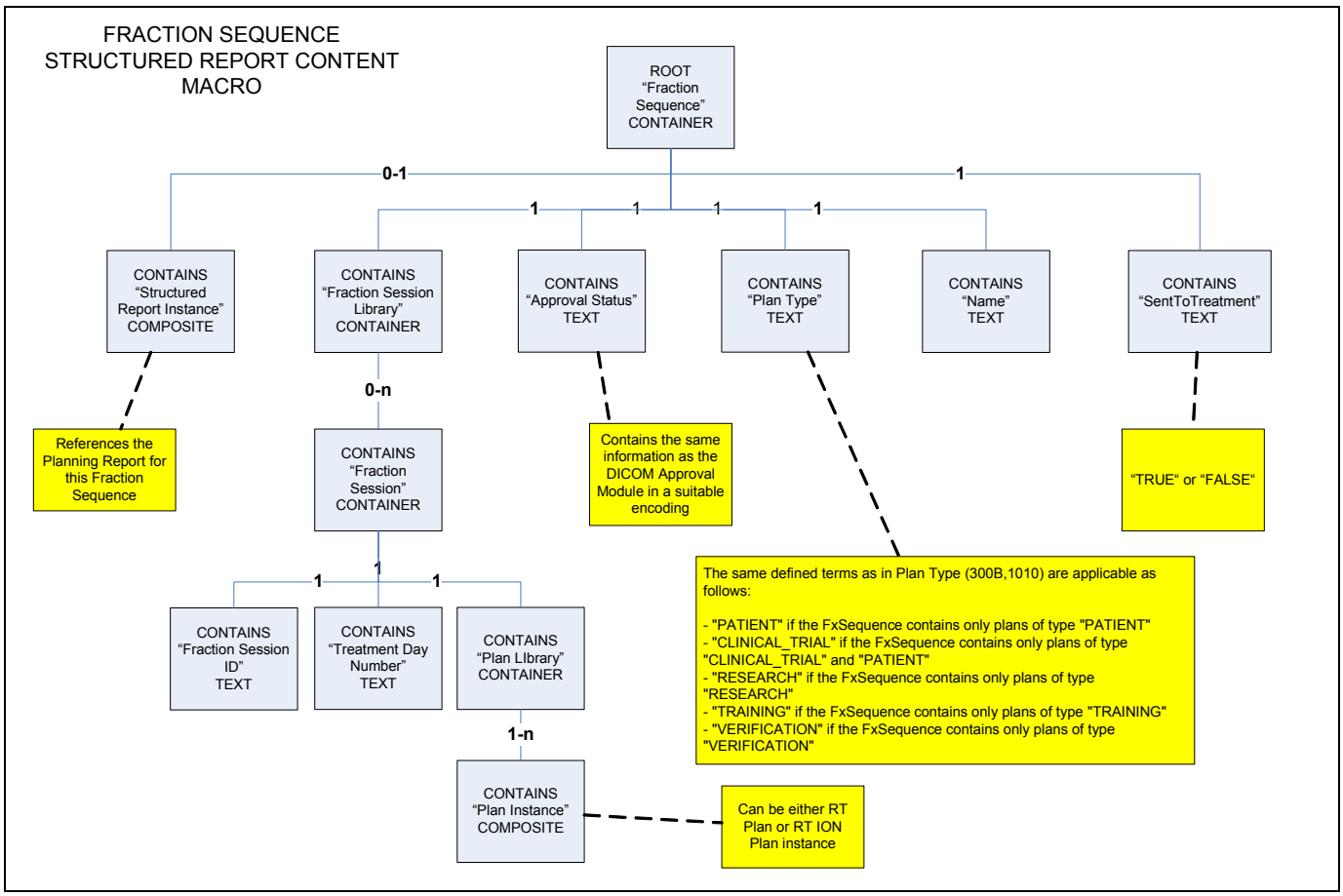

FRACTION SEQUENCE STRUCTURED REPORT CONTENT MACRO
ROOT "Fraction Sequence" CONTAINER
0-1
1
1
1
1
1
CONTAINS "Structured Report Instance" COMPOSITE
CONTAINS "Fraction Session Library" CONTAINER
CONTAINS "Approval Status" TEXT
CONTAINS "Plan Type" TEXT
CONTAINS "Name" TEXT
CONTAINS "SentToTreatment" TEXT
References the Planning Report for this Fraction Sequence
0-n
Contains the same information as the DICOM Approval Module in a suitable encoding
"TRUE" or "FALSE"
CONTAINS "Fraction Session" CONTAINER
1
1
1
CONTAINS "Fraction Session ID" TEXT
CONTAINS "Treatment Day Number" TEXT
CONTAINS "Plan LIbrary" CONTAINER
The same defined terms as in Plan Type (300B,1010) are applicable as follows:
- "PATIENT" if the FxSequence contains only plans of type "PATIENT"
- "CLINICAL_TRIAL" if the FxSequence contains only plans of type "CLINICAL_TRIAL" and "PATIENT"
- "RESEARCH" if the FxSequence contains only plans of type "RESEARCH"
- "TRAINING" if the FxSequence contains only plans of type "TRAINING"
- "VERIFICATION" if the FxSequence contains only plans of type "VERIFICATION"
1-n
CONTAINS "Plan Instance" COMPOSITE
Can be either RT Plan or RT ION Plan instance

Figure 8-10: Fraction Sequence SR

8.10.2 Position Correction SR

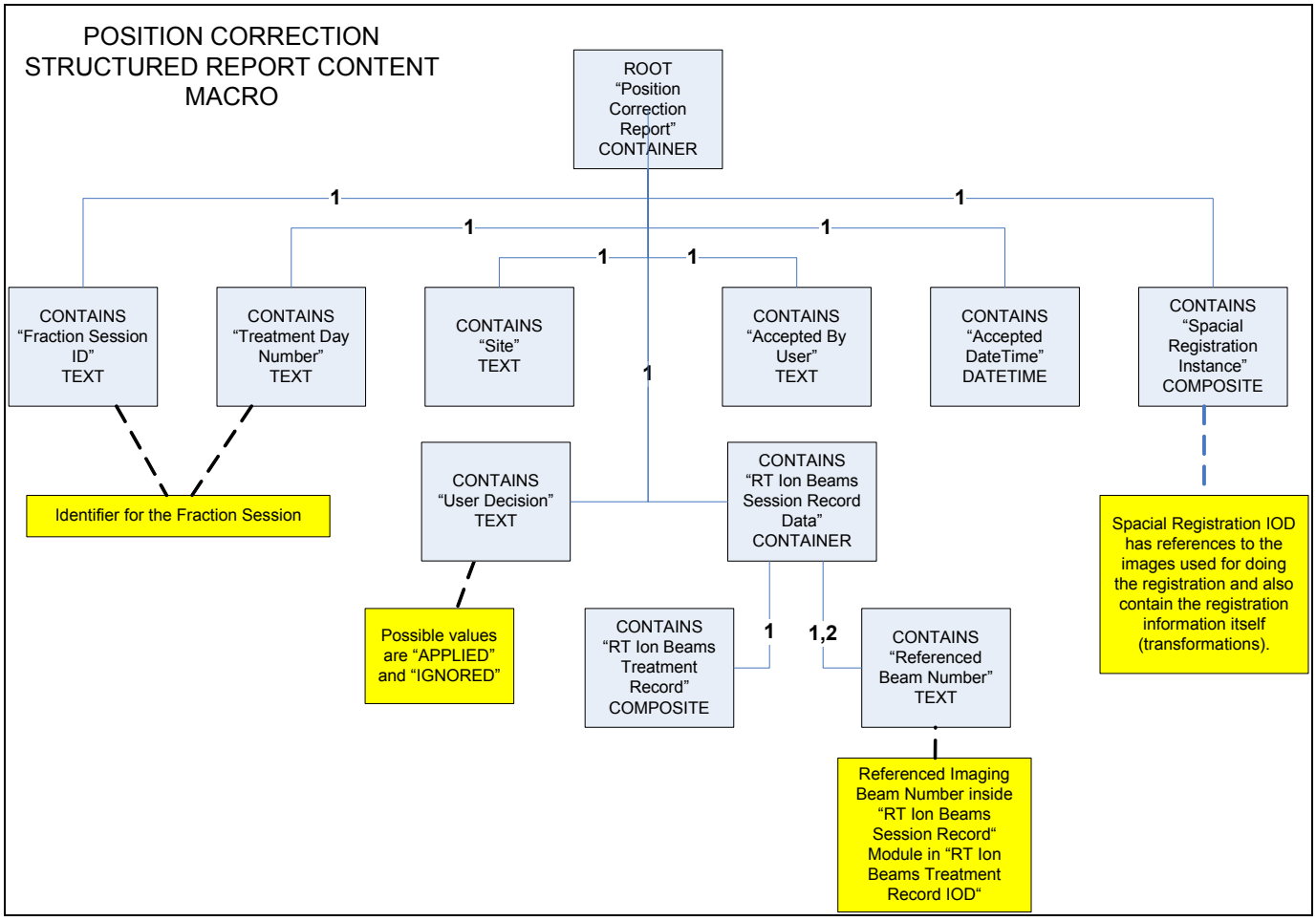

POSITION CORRECTION STRUCTURED REPORT CONTENT MACRO
ROOT "Position Correction Report" CONTAINER
CONTAINS "Fraction Session ID" TEXT
CONTAINS "Treatment Day Number" TEXT
CONTAINS "Site" TEXT
CONTAINS "Accepted By User" TEXT
CONTAINS "Accepted DateTime" DATETIME
CONTAINS "Spacial Registration Instance" COMPOSITE
Identifier for the Fraction Session
CONTAINS "User Decision" TEXT
CONTAINS "RT Ion Beams Session Record Data" CONTAINER
Possible values are "APPLIED" and "IGNORED"
CONTAINS "RT Ion Beams Treatment Record" COMPOSITE
CONTAINS "Referenced Beam Number" TEXT
Referenced Imaging Beam Number inside "RT Ion Beams Session Record" Module in "RT Ion Beams Treatment Record IOD"
Spacial Registration IOD has references to the images used for doing the registration and also contain the registration information itself (transformations).
1
1,2

Figure 8-11: Position Correction SR

8.10.3 Treatment Course SR

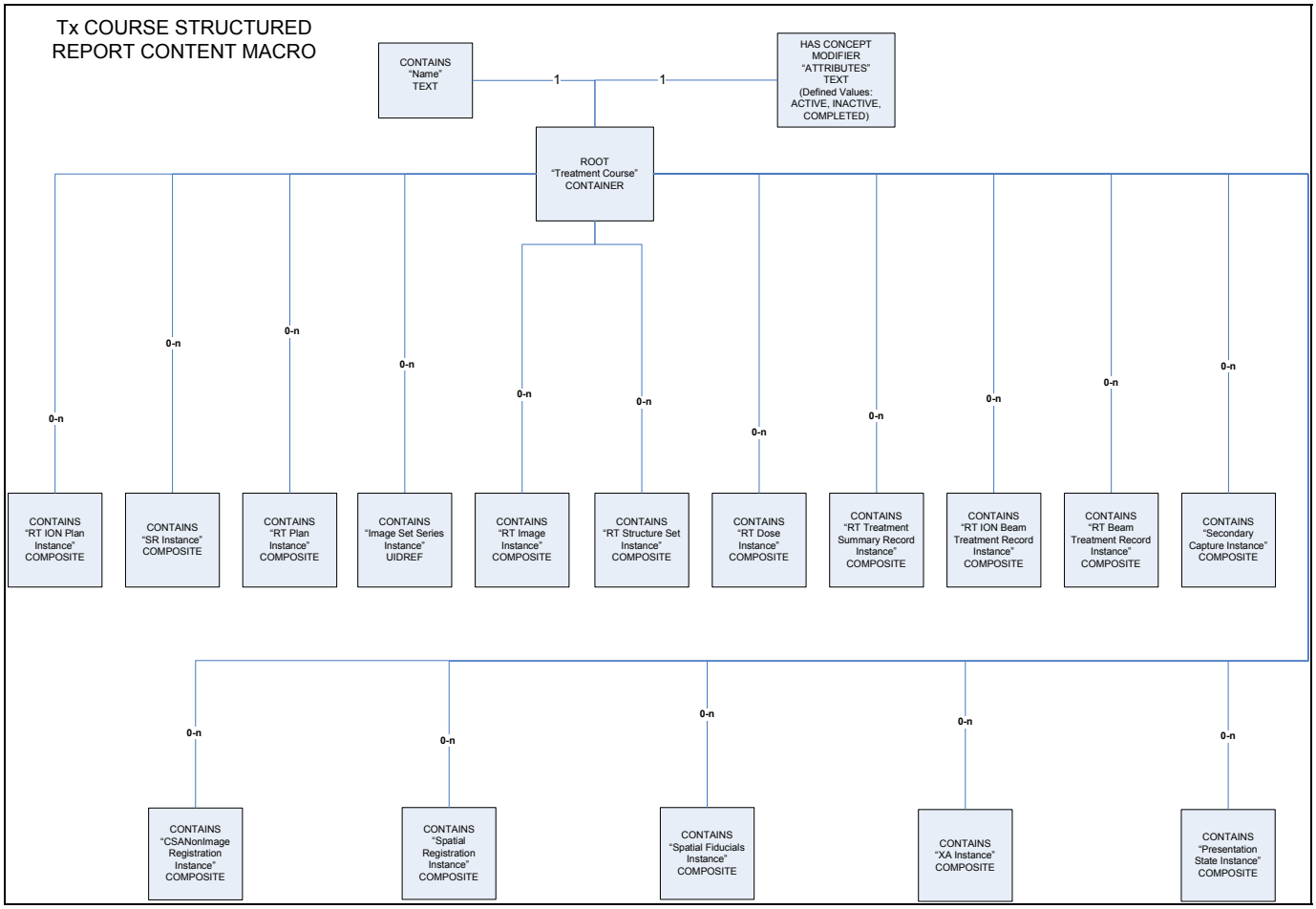

Tx COURSE STRUCTURED REPORT CONTENT MACRO
CONTAINS "Name" TEXT
1
1
HAS CONCEPT MODIFIER "ATTRIBUTES" TEXT (Defined Values: ACTIVE, INACTIVE, COMPLETED)
ROOT "Treatment Course" CONTAINER
0-n
CONTAINS "RT ION Plan Instance" COMPOSITE
CONTAINS "SR Instance" COMPOSITE
CONTAINS "RT Plan Instance" COMPOSITE
CONTAINS "Image Set Series Instance" UIDREF
CONTAINS "RT Image Instance" COMPOSITE
CONTAINS "RT Structure Set Instance" COMPOSITE
CONTAINS "RT Dose Instance" COMPOSITE
CONTAINS "RT Treatment Summary Record Instance" COMPOSITE
CONTAINS "RT ION Beam Treatment Record Instance" COMPOSITE
CONTAINS "RT Beam Treatment Record Instance" COMPOSITE
CONTAINS "Secondary Capture Instance" COMPOSITE
CONTAINS "CSAOnImage Registration Instance" COMPOSITE
CONTAINS "Spatial Registration Instance" COMPOSITE
CONTAINS "Spatial Fiducials Instance" COMPOSITE
CONTAINS "XA Instance" COMPOSITE
CONTAINS "Presentation State Instance" COMPOSITE

Figure 8-12: Treatment Course SR

8.10.4 Fraction Sequence Report ESR

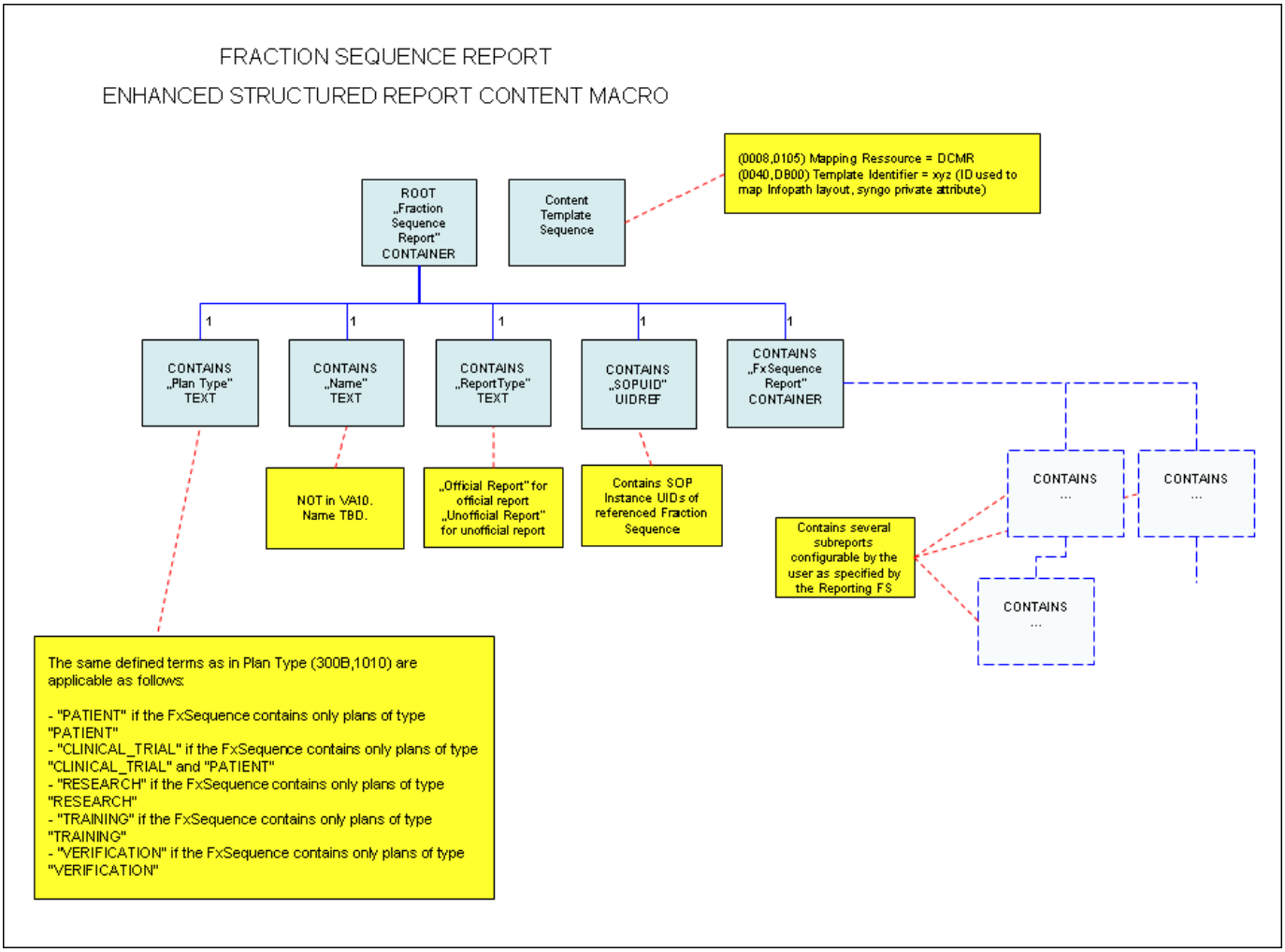

FRACTION SEQUENCE REPORT
ENHANCED STRUCTURED REPORT CONTENT MACRO
(0008,0105) Mapping Ressource = DCMR
(0040,DB00) Template Identifier = xyz (ID used to map Infopath layout, syngo private attribute)
ROOT „Fraction Sequence Report" CONTAINER
Content Template Sequence
1
CONTAINS „Plan Type" TEXT
CONTAINS „Name" TEXT
CONTAINS „ReportType" TEXT
CONTAINS „SOPUID" UIDREF
CONTAINS „FxSequence Report" CONTAINER
NOT in VA10. Name TBD.
„Official Report" for official report „Unofficial Report" for unofficial report
Contains SOP Instance UIDs of referenced Fraction Sequence
CONTAINS ...
Contains several subreports configurable by the user as specified by the Reporting FS
The same defined terms as in Plan Type (300B,1010) are applicable as follows:
- "PATIENT" if the FxSequence contains only plans of type "PATIENT"
- "CLINICAL_TRIAL" if the FxSequence contains only plans of type "CLINICAL_TRIAL" and "PATIENT"
- "RESEARCH" if the FxSequence contains only plans of type "RESEARCH"
- "TRAINING" if the FxSequence contains only plans of type "TRAINING"
- "VERIFICATION" if the FxSequence contains only plans of type "VERIFICATION"

Figure 8-13: Fraction Sequence Report ESR

8.11 Macros

8.11.1 Image SOP Instance Reference Macro

Attribute Name	Tag	Type	VR, VM	Attribute Description
Referenced SOP Class UID	(0008,1150)	1	UI 1	Uniquely identifies the referenced SOP Class.
Referenced SOP Instance UID	(0008,1155)	1	UI 1	Uniquely identifies the referenced SOP Instance.
Referenced Frame Number	(0008,1160)	1C	IS 1-n	Identifies the frame numbers within the Referenced SOP Instance to which the reference applies. The first frame shall be denoted as frame number 1. Note: This Attribute may be multi-valued. Required if the Referenced SOP Instance is a multi-frame image and the reference does not apply to all frames.

8.11.2 SOP Instance Reference Macro

Attribute Name	Tag	Type	VR, VM	Attribute Description
Referenced SOP Class UID	(0008,1150)	1	UI 1	Uniquely identifies the referenced SOP Class.
Referenced SOP Instance UID	(0008,1155)	1	UI 1	Uniquely identifies the referenced SOP Instance.

8.11.3 Code Sequence Macro

Attribute Name	Tag	Type	VR, VM	Attribute Description
BASIC CODED ENTRY ATTRIBUTES				
Code Value	(0008,0100)	1C	SH 1	See Section 8.1. Required if a sequence item is present.
Coding Scheme Designator	(0008,0102)	1C	SH 1	See Section 8.2. Required if a sequence item is present.
Coding Scheme Version	(0008,0103)	1C	SH 1	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.
Code Meaning	(0008,0104)	1C	LO 1	See Section 8.3. Required if a sequence item is present.
ENHANCED ENCODING MODE				
Context Identifier	(0008,010F)	3	CS 1	See Section 8.6.
Mapping Resource	(0008,0105)	1C	CS 1	See Section 8.4. Required if Context Identifier (0008,010F) is present.
Context Group Version	(0008,0106)	1C	DT 1	See Section 8.5. Required if Context Identifier (0008,010F) is present.
Context Group Extension Flag	(0008,010B)	3	CS 1	Indicates whether the Code Value/Coding Scheme/Code Meaning is selected from a private extension of the Context Group identified in Context Identifier (0008,010F). See Section 8.7 of this Part. Enumerated Values: “Y”, ”N”
Context Group Local Version	(0008,0107)	1C	DT 1	See Section 8.7. Required if the value of Context Group Extension Flag (0008,010B) is ""Y"".
Context Group Extension Creator UID	(0008,010D)	1C	UI 1	Identifies the person or organization who created an extension to the Context Group. See Section 8.7. Required if the value of Context Group Extension Flag (0008,010B) is ""Y"".

8.11.4 Basic Pixel Spacing Calibration Macro

Attribute Name	Tag	Type	VR, VM	Attribute Description
Pixel Spacing	(0028,0030)	1C	US,1	Physical distance in the patient between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm. See Pixel Spacing and see Pixel Spacing Value Order for further explanation.
Pixel Spacing Calibration Type	(0028,0402)	3	CS,1	The type of correction for the effect of geometric magnification or calibration against an object of known size, if any. Enumerated Values: - GEOMETRY = The Pixel Spacing (0028,0030) values account for assumed or known geometric magnification effects and correspond to some unspecified depth within in the patient; the Pixel Spacing (0028,0030) values may thus be used for measurements of objects located close to the central ray and at the same depth. - FIDUCIAL = The Pixel Spacing (0028,0030) values have been calibrated by the operator or image processing software by measurement of an object (fiducial) that is visible in the pixel data and is of known size and is located close to the central ray; the Pixel Spacing (0028,0030) values may thus be used for measurements of objects located close to the central ray and located at the same depth within the patient as the fiducial. See Pixel Spacing Calibration Type.
Pixel Spacing Calibration Description	(0028,0404)	1C	LO,1	A free text description of the type of correction or calibration performed. Notes: 1. In the case of correction, the text might include description of the assumptions made about the body part and geometry and depth within the patient. 2. in the case of calibration, the text might include a description of the fiducial and where it is located (for example, "XYZ device applied to the skin over the greater trochanter").

Attribute Name	Tag	Type	VR, VM	Attribute Description
				3. Though it is not required, the Device Module may be used to describe the specific characteristics and size of the calibration device . Required if Pixel Spacing Calibration Type (0028,0402) is present.

8.11.5 Container Macro

Attribute Name	Tag	Type	VR, VM	Attribute Description
Continuity of Content	(0040,A050)	1	CS,1	This flag specifies for a CONTAINER whether or not its contained Content Items are logically linked in a continuous textual flow, or are separate items. Enumerated Values: SEPARATE CONTINUOUS See PS 3.3 C.18.8.1.1 for further explanation.
Content Template Sequence	(0040,A504)	1C	SQ,1	Template that describes the content of this Content Item and its subsidiary Content Items. Only a single Item shall be permitted in this sequence. Required if a template was used to define the content of this Item, and the template consists of a single CONTAINER with nested content, and it is the outermost invocation of a set of nested templates that start with the same CONTAINER (see PS 3.3 C.18.8.1.2).
>Mapping Resource	(0008,0105)	1	CS,1	Mapping Resource that defines the template. See Section 8.4. Defined Terms: DCMR = DICOM Content Mapping Resource
>Template Identifier	(0040,DB00)	1	CS,1	Template identifier.

8.11.6 Series and Instance Reference Macro

Attribute Name	Tag	Type	VR, VM	Attribute Description
Referenced Series Sequence	(0008,1115)	1	SQ 1	Sequence of Items each of which includes the Attributes of one Series. One or more Items shall be present.
>Series Instance UID	(0020,000E)	1	UI 1	Unique identifier of the Series containing the referenced Instances.
>Referenced Instance Sequence	(0008,114A)	1	SQ 1	Sequence of Items each providing a reference to an Instance that is part of the Series defined by Series Instance UID (0020,000E) in the enclosing Item. One or more Items shall be present.
>>Referenced SOP Class UID	(0008,1150)	1	UI 1	Uniquely identifies the referenced SOP Class.
>>Referenced SOP Instance UID	(0008,1155)	1	UI 1	Uniquely identifies the referenced SOP Instance.

8.11.7 Document Content Macro

Attribute Name	Tag	Type	VR, VM	Attribute Description
Value Type	(0040,A040)	1	CS,1	The type of the value encoded in this Content Item. Defined Terms: TEXT NUM CODE DATETIME DATE TIME UIDREF PNAME COMPOSITE IMAGE

Attribute Name	Tag	Type	VR, VM	Attribute Description
				WAVEFORM SCOORD TCOORD CONTAINER See PS 3.3 C.17.3.2.1 for further explanation.
Concept Name Code Sequence	(0040,A043)	1C	SQ,1	Code describing the concept represented by this Content Item. Also conveys the value of Document Title and section headings in documents. Only a single Item shall be permitted in this sequence. Required if Value Type (0040,A040) is TEXT or NUM or CODE or DATETIME or DATE or TIME or UIDREF or PNAME. Required if Value Type (0040,A040) is CONTAINER and a heading is present, or this is the Root Content Item. Note: That is, containers without headings do not require Concept Name Code Sequence Required if Value Type (0040,A040) is COMPOSITE, IMAGE, WAVEFORM, SCOORD or TCOORD, and the Purpose of Reference is conveyed in the Concept Name. See PS 3.3 C.17.3.2.2 for further explanation.
>Include 'Code Sequence Macro' Table 8.8-1				No Baseline Context ID.
Text Value	(0040,A160)	1C	UT,1	This is the value of the Content Item. Required if Value Type (0040,A040) is TEXT. Text data which is unformatted and whose manner of display is implementation dependent. The text value may contain spaces, as well as multiple lines separated by either LF, CR, CR LF or LF CR, but otherwise no format control characters (such as horizontal or vertical tab and form feed) shall be present, even if permitted by the Value Representation of UT. The text shall be interpreted as specified by Specific Character Set (0008,0005) if present in the SOP Common Module. Note: The text may contain single or multibyte characters and use code extension techniques as described in PS 3.5 if permitted by the values of Specific Character Set (0008,0005).
DateTime	(0040,A120)	1C	DT,1	This is the value of the Content Item. Required if Value Type (0040,A040) is DATETIME.
Date	(0040,A121)	1C	DA,1	This is the value of the Content Item. Required if Value Type (0040,A040) is DATE.
Time	(0040,A122)	1C	TM,1	This is the value of the Content Item. Required if Value Type (0040,A040) is TIME.
Person Name	(0040,A123)	1C	PN,1	This is the value of the Content Item. Required if Value Type (0040,A040) is PNAME.
UID	(0040,A124)	1C	UI,1	This is the value of the Content Item. Required if Value Type (0040,A040) is UIDREF.
Include 'Numeric Measurement Macro' Table PS 3.3 C.18.1-1 if and only if Value Type (0040,A040) is NUM.				
Include 'Code Macro' Table PS 3.3 C.18.2-1 if and only if Value Type (0040,A040) is CODE.				
Include 'Composite Object Reference Macro' Table PS 3.3 C.18.3-1				

Attribute Name	Tag	Type	VR, VM	Attribute Description
if and only if Value Type (0040,A040) is COMPOSITE				
Include 'Image Reference Macro' Table PS 3.3 C.18.4-1 if and only if Value Type (0040,A040) is IMAGE.				
Include 'Waveform Reference Macro' Table PS 3.3 C.18.5-1 if and only if Value Type (0040,A040) is WAVEFORM.				
Include 'Spatial Coordinates Macro' Table PS 3.3 C.18.6-1 if and only if Value Type (0040,A040) is SCOORD.				
Include 'Temporal Coordinates Macro' Table PS 3.3 C.18.7-1 if and only if Value Type (0040,A040) is TCOORD.				
Include 'Container Macro' Table PS 3.3 C.18.8-1 if and only if Value Type (0040,A040) is CONTAINER.				

8.11.8 Document Relationship Macro

Attribute Name	Tag	Type	VR, VM	Attribute Description
Observation DateTime	(0040,A032)	1C	DT,1	The date and time on which this Content Item was completed. For the purpose of recording measurements or logging events, completion time is defined as the time of data acquisition of the measurement, or the time of occurrence of the event. Required if the date and time are different from the Content Date (0008,0023) and Content Time (0008,0033) or the Observation DateTime (0040,A032) defined in higher items. May be present otherwise. Note: When Content Items are copied into successor reports, the Content Date (0008,0023) and Content Time (0008,0033) of the new report are likely to be different than the date and time of the original observation. Therefore this attribute may need to be included in any copied Content Items to satisfy the condition.
Content Sequence	(0040,A730)	1C	SQ,1	A potentially recursively nested Sequence of Items that conveys content that is the Target of Relationships with the enclosing Source Content Item. One or more Items may be included in this sequence. Required if the enclosing Content Item has relationships. Notes: 1. If this Attribute is not present then the enclosing Item is a leaf. 2. The order of Items within this Sequence is semantically significant for presentation. See PS 3.3 C.17.3.2.4 for further explanation.
>Relationship Type	(0040,A010)	1	CS,1	The type of relationship between the (enclosing) Source Content Item and the Target Content Item. IODs specify additional constraints on Relationships (including lists of Enumerated Values). Defined Terms: CONTAINS HAS PROPERTIES HAS OBS CONTEXT HAS ACQ CONTEXT INFERRED FROM SELECTED FROM HAS CONCEPT MOD See PS 3.3 C.17.3.2.4 for further explanation.
>Include Document Relationship Macro Table PS 3.3 C.17-6 if the Target Content Item is included by-value in the Source Content Item. The Macro shall not be present if the relationship is by-reference.				
>Include Document Content Macro Table PS 3.3 C.17-5 if the Target Content Item is included by-value in the Source Content Item. The Macro shall not be present if the relationship is by-reference.				
>Referenced Content Item	(0040,DB73)	1C	UL,1-n	An ordered set of one or more integers that uniquely identifies

Attribute Name	Tag	Type	VR, VM	Attribute Description
Identifier				the Target Content Item of the relationship. The root Content Item is referenced by a single value of 1.Each subsequent integer represents an ordinal position of a Content Item in the Content Sequence (0040,A730) in which it belongs. The Referenced Content Item Identifier is the set of these ordinal positions along the by-value relationship path. The number of values in this Multi-Value Attribute is exactly the number of relationships traversed in the SR content tree plus one. Note: 1. See PS 3.3 C.17.3.2.5. 2. Content Items are ordered in a Content Sequence starting from 1 as defined in VR of SQ (See PS 3.5). Required if the Target Content Item is denoted by-reference, i.e. the Document Relationship Macro and Document Content Macro are not included.

8.12 Private Attribute Schemas

8.12.1 Common.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema
 elementFormDefault="qualified"
 xmlns:xs="http://www.w3.org/2001/XMLSchema"
 targetNamespace="http://www.siemens.com/med/ocs/syngoRT/Common"
 xmlns="http://www.siemens.com/med/ocs/syngoRT/Common">
 <xs:annotation>
  <xs:documentation>
   A collection of type definitions used across the syngo RT XML based extensions.
  </xs:documentation>
 </xs:annotation>
 <xs:simpleType name="DICOMDateTime">
  <xs:annotation>
   <xs:documentation>
    The DICOM Date Time common data type. Indicates a concatenated date-time ASCII string in the format:
    YYYYMMDDHHMMSS.FFFFFF&amp;amp;ZZZZ. The components of this string, from left to right, are
    YYYY = Year,
    MM = Month,
    DD = Day,
    HH = Hour,
    MM = Minute,
    SS = Second,
    &amp;amp; = "+" or "-",
    FFFFFF = Fractional Second,
    ZZZZ = Hours and Minutes of offset. &amp;amp;ZZZZ is an optional suffix for plus/minus offset
    from Coordinated Universal Time.
    (taken from the DICOM standard 2007, Part 5, Value Representation)
   </xs:documentation>
  </xs:annotation>
  <xs:restriction base="xs:string">
   <xs:pattern value="[0-9]{14}.[0-9]{6}([-+][0-9]{4})?" />
  </xs:restriction>
 </xs:simpleType>
 <xs:simpleType name="OrientationType">
  <xs:restriction base="xs:string">
   <xs:enumeration value="OBVERSE">
    <xs:annotation>
     <xs:documentation>
      Obverse side of reference structure
     </xs:documentation>
    </xs:annotation>
   </xs:enumeration>
   <xs:enumeration value="REVERSE">
```

```
      <xs:annotation>
        <xs:documentation>
          Reverse side of reference structure
        </xs:documentation>
      </xs:annotation>
    </xs:enumeration>
  </xs:restriction>
 </xs:simpleType>
 <xs:complexType name="Vector3DType">
  <xs:sequence>
    <xs:element name="X" type="xs:double" />
    <xs:element name="Y" type="xs:double" />
    <xs:element name="Z" type="xs:double" />
  </xs:sequence>
 </xs:complexType>
 <xs:complexType name="RGBColorType">
  <xs:sequence>
    <xs:element name="R" type="xs:unsignedByte" />
    <xs:element name="G" type="xs:unsignedByte" />
    <xs:element name="B" type="xs:unsignedByte" />
  </xs:sequence>
 </xs:complexType>
 <xs:simpleType name="NameType">
  <xs:restriction base="xs:token">
    <xs:length value="1" />
  </xs:restriction>
 </xs:simpleType>
</xs:schema>
```

8.12.2 RTStructureSetExtensions.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema
 xmlns:xs="http://www.w3.org/2001/XMLSchema"
 targetNamespace="http://www.siemens.com/med/ocs/syngoRT/RTStructureSetExtensions"
 xmlns="http://www.siemens.com/med/ocs/syngoRT/RTStructureSetExtensions"
 xmlns:uinf="http://www.siemens.com/med/ocs/usageInformation"
 xmlns:syngoRTExt="http://www.siemens.com/med/ocs/syngoRT/Common">
 <xs:import
  namespace="http://www.siemens.com/med/ocs/syngoRT/Common"
  schemaLocation="Common.xsd" />
 <xs:import
  namespace="http://www.siemens.com/med/ocs/usageInformation"
  schemaLocation="usageInformation.xsd" />
 <xs:element name="RTStructureSet">
  <xs:annotation>
    <xs:documentation>
      Extensions for the RT Structure Set IOD
    </xs:documentation>
  </xs:annotation>
  <xs:complexType>
    <xs:sequence>
      <xs:element name="StructureSet" type="StructureSetExtensionsType" minOccurs="0" maxOccurs="1" />
      <xs:element name="RTROIObservation" type="RTROIObservationExtensionsType" minOccurs="0"
maxOccurs="1" />
    </xs:sequence>
  </xs:complexType>
 </xs:element>
 <xs:complexType name="RTROIObservationExtensionsType">
  <xs:annotation>
    <xs:documentation>
      Extensions for the RT ROI Observation Module
    </xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="RTROIObservations" minOccurs="0" maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>
          Extensions for the Structure Set::RT ROI Observations Sequence
        </xs:documentation>
      </xs:annotation>
```

```
      <xs:complexType>
        <xs:sequence>
          <xs:element name="ROINumber" type="xs:integer" minOccurs="1" maxOccurs="1">
            <xs:annotation>
              <xs:documentation>
                Uniquely identifies the referenced ROI described in the
                "Structure Set::Structure Set ROI Sequence" for which the private information
                applies.
              </xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="DosimetricPointType" minOccurs="0" maxOccurs="1">
            <xs:annotation>
              <xs:documentation>
                Assigns a dosimetric point type to structures of "RT ROI Interpreted type" (3006,00A4)
                ISOCENTER or MARKER which have a dosimetric type assigned.
              </xs:documentation>
              <xs:appinfo uinf:app="WS" uinf:usage="READ" />
              <xs:appinfo uinf:app="DCOpt" uinf:usage="READ" />
              <xs:appinfo uinf:app="VSIM" uinf:usage="WRITTEN" />
            </xs:annotation>
            <xs:simpleType>
              <xs:restriction base="xs:string">
                <xs:enumeration value="ICRU">
                  <xs:annotation>
                    <xs:documentation>
                      ICRU dosimetric point
                    </xs:documentation>
                  </xs:annotation>
                </xs:enumeration>
                <xs:enumeration value="PRIMARY">
                  <xs:annotation>
                    <xs:documentation>
                      primary dosimetric point
                    </xs:documentation>
                  </xs:annotation>
                </xs:enumeration>
                <xs:enumeration value="MEASURING">
                  <xs:annotation>
                    <xs:documentation>
                      measuring dosimetric point
                    </xs:documentation>
                  </xs:annotation>
                </xs:enumeration>
              </xs:restriction>
            </xs:simpleType>
          </xs:element>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="StructureSetExtensionsType">
  <xs:annotation>
    <xs:documentation>
      Extensions for the Structure Set Module
    </xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="StructureSetROI" minOccurs="0" maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>
          Extensions for the Structure Set::Structure Set ROI Sequence
        </xs:documentation>
      </xs:annotation>
      <xs:complexType>
        <xs:sequence>
          <xs:element name="ROINumber" type="xs:integer" minOccurs="1" maxOccurs="1">
            <xs:annotation>
              <xs:documentation>
                Uniquely identifies the ROI in the "Structure Set::Structure Set ROI Sequence"
                for which the private information applies.
```

```
            </xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="ROIBiologicalCellIdentifier" type="xs:string" minOccurs="0" maxOccurs="1">
          <xs:annotation>
            <xs:documentation>
              Name of the biological cell type associated with this ROI.The name
              is the primary key of the respective item in the ConfigDataSC database.
              ConfigDataSC identifiers are strings with a maximum length of 16 characters.
              If cell parameters are required for a calculation, the cell type of the
              external structure is used as default and is thus mandatory.
            </xs:documentation>
            <xs:appinfo uinf:app="WS" uinf:usage="READ" />
            <xs:appinfo uinf:app="DCOpt" uinf:usage="READ" />
            <xs:appinfo uinf:app="VSIM" uinf:usage="WRITTEN" />
          </xs:annotation>
        </xs:element>
        <xs:element name="ROIMaterialIdentifier" type="xs:string" minOccurs="0" maxOccurs="1">
          <xs:annotation>
            <xs:documentation>
              Name of the physics material associated with this ROI. The name
              is the primary key of the respective item in the ConfigDataSC database.
              This attribute is only sent, if a specific material is applied to a ROI.
            </xs:documentation>
            <xs:appinfo uinf:app="WS" uinf:usage="READ" />
            <xs:appinfo uinf:app="DCOpt" uinf:usage="READ" />
            <xs:appinfo uinf:app="VSIM" uinf:usage="WRITTEN" />
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
 </xs:sequence>
</xs:complexType>
</xs:schema>
```

8.12.3 RTPlanExtensions.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.siemens.com/med/ocs/syngoRT/RTPlanExtensions"
xmlns="http://www.siemens.com/med/ocs/syngoRT/RTPlanExtensions"
xmlns:uinf="http://www.siemens.com/med/ocs/usageInformation"
xmlns:syngoRT="http://www.siemens.com/med/ocs/syngoRT/Common"
xmlns:NS="http://www.siemens.com/med/ocs/syngoRT/RTPlanExtensions" version="1.0">
        <xs:import namespace="http://www.siemens.com/med/ocs/syngoRT/Common"
schemaLocation="Common.xsd" />
        <xs:import namespace="http://www.siemens.com/med/ocs/usageInformation"
schemaLocation="usageInformation.xsd" />
        <xs:annotation>
                <xs:documentation>
    This schema defines the content of the private DICOM tag "SIEMENS MED OCS PUBLIC RT PLAN ATTRIBUTES".
  </xs:documentation>
        </xs:annotation>
        <xs:simpleType name="Lead_Dose_Type">
                <xs:restriction base="xs:double">
                        <xs:minInclusive value="0" />
                </xs:restriction>
        </xs:simpleType>
        <xs:simpleType name="Fraction_Time_Interval_Type">
                <xs:restriction base="xs:double">
                        <xs:minInclusive value="0" />
                </xs:restriction>
        </xs:simpleType>
        <xs:complexType name="RT_Tolerance_Table_Shadow_Attribute_Schema">
                <xs:sequence>
                        <xs:element name="RT_Tolerance_Table" maxOccurs="unbounded">
                                <xs:complexType>
                                        <xs:all>
                                                <xs:element name="RT_Tolerance_Table_Creation_Date_Time"
type="xs:string" minOccurs="0" maxOccurs="1" />
```

```
                                        <xs:element name="SID_Tolerance" type="xs:long"
minOccurs="0" maxOccurs="1" />
                                        <xs:element name="FlatPanel_LateralPos_Tolerance"
type="xs:long" minOccurs="0" maxOccurs="1" />
                                        <xs:element name="FlatPanel_LongitudinalPos_Tolerance"
type="xs:long" minOccurs="0" maxOccurs="1" />
                                        <xs:element name="KV_SID_Tolerance" type="xs:long"
minOccurs="0" maxOccurs="1" />
                                        <xs:element name="KV_FlatPanel_LateralPos_Tolerance"
type="xs:long" minOccurs="0" maxOccurs="1" />
                                    </xs:all>
                                    <xs:attribute name="Tolerance_Table_Number" type="xs:long"
use="required" />
                                </xs:complexType>
                            </xs:element>
                        </xs:sequence>
                    </xs:complexType>
                    <xs:complexType name="RT_Prescription_Shadow_Attribute_Schema">
                        <xs:sequence>
                            <xs:element name="RT_Prescription" maxOccurs="unbounded">
                                <xs:complexType>
                                    <xs:all>
                                        <xs:element name="RT_Prescription_Creation_Date_Time"
type="xs:string" minOccurs="0" maxOccurs="1" />
                                        <xs:element name="Lead_Dose" type="Lead_Dose_Type"
minOccurs="0" />
                                        <xs:element name="Delivery_Warning_Dose_Description"
type="xs:string" minOccurs="0" />
                                    </xs:all>
                                    <xs:attribute name="Dose_Reference_Number" type="xs:long"
use="required" />
                                </xs:complexType>
                            </xs:element>
                        </xs:sequence>
                    </xs:complexType>
                    <xs:complexType name="RT_Patient_Setup_Shadow_Attribute_Schema">
                        <xs:sequence>
                            <xs:element name="RT_Patient_Setup" maxOccurs="unbounded">
                                <xs:complexType>
                                    <xs:sequence>
                                        <xs:element name="RT_Patient_Setup_Creation_Date_Time"
type="xs:string" minOccurs="0" maxOccurs="1" />
                                        <xs:element name="Patient_Setup_Name" type="xs:string" />
                                        <xs:element name="Additional_Setup_Instructions"
type="xs:string" />
                                        <xs:element name="Referenced_Setup_Image_Sequence"
minOccurs="0">
                                            <xs:complexType>
                                                <xs:sequence>
                                                    <xs:element name="Setup_Image"
minOccurs="1">
                                                        <xs:complexType>
                                                            <xs:sequence>
                                                                <xs:element
name="Setup_Image_Description" type="xs:string" />
                                                                <xs:element
name="Referenced_SOP_Class_UID" type="xs:string" />
                                                                <xs:element
name="Referenced_SOP_Instance_UID" type="xs:string" />
                                                            </xs:sequence>
                                                        </xs:complexType>
                                                    </xs:element>
                                                </xs:sequence>
                                            </xs:complexType>
                                        </xs:element>
                                    </xs:sequence>
                                    <xs:attribute name="Patient_Setup_Number" type="xs:long"
use="required" />
                                </xs:complexType>
                            </xs:element>
                        </xs:sequence>
                    </xs:complexType>
```

```
        <xs:complexType name="RT_Fraction_Group_Shadow_Attribute_Schema">
                <xs:sequence>
                        <xs:element name="RT_Fraction_Group" maxOccurs="unbounded">
                                <xs:complexType>
                                        <xs:all>
                                                <xs:element name="RT_Fraction_Group_Creation_Date_Time"
type="xs:string" minOccurs="0" maxOccurs="1" />
                                                <xs:element name="Fraction_Group_Name" type="xs:string" />
                                                <xs:element name="Fraction_Time_Interval"
type="Fraction_Time_Interval_Type" minOccurs="0" />
                                                <xs:element name="Fractions_Per_Week" type="xs:long" />
                                        </xs:all>
                                        <xs:attribute name="Fraction_Group_Number" type="xs:long"
use="required" />
                                </xs:complexType>
                        </xs:element>
                </xs:sequence>
        </xs:complexType>
        <xs:complexType name="PatchPlaneType">
                <xs:annotation>
                        <xs:documentation>
      The information in this structure describe a patch plane.
      Patch planes are used to define an overlap area between 2 or
      more beams coming from different directions.
    </xs:documentation>
                </xs:annotation>
                <xs:sequence>
                        <xs:element name="PlaneName" type="xs:string">
                                <xs:annotation>
                                        <xs:documentation>
        Name of the patch plane.
      </xs:documentation>
                                </xs:annotation>
                        </xs:element>
                        <xs:element name="PointOnPlane" type="syngoRT:Vector3DType">
                                <xs:annotation>
                                        <xs:documentation>
        Defines the plane's position. Patch planes are defined in the CT coordinate system.
      </xs:documentation>
                                </xs:annotation>
                        </xs:element>
                        <xs:element name="NormVectorOfPlane" type="syngoRT:Vector3DType">
                                <xs:annotation>
                                        <xs:documentation>
        Defines the plane's orientation. Points in Obverse direction.
      </xs:documentation>
                                </xs:annotation>
                        </xs:element>
                        <xs:element name="PlaneThickness" type="xs:double">
                                <xs:annotation>
                                        <xs:documentation>
        Width of overlap area, in mm.
      </xs:documentation>
                                </xs:annotation>
                        </xs:element>
                        <xs:element name="ObverseDosePercent" type="xs:double">
                                <xs:annotation>
                                        <xs:documentation>
        Defines the gradient of the overlap, together with ReverseDosePercent.
        Percent of max dose which all beams on the obverse side of the plane must add up to.
      </xs:documentation>
                                </xs:annotation>
                        </xs:element>
                        <xs:element name="ReverseDosePercent" type="xs:double">
                                <xs:annotation>
                                        <xs:documentation>
        Defines the gradient of the overlap, together with ObverseDosePercent.
        Percent of max dose which all beams on the reverse side of the plane must add up to.
      </xs:documentation>
                                </xs:annotation>
                        </xs:element>
                        <xs:element name="DisplayColor" type="syngoRT:RGBColorType">
```

```
                                <xs:annotation>
                                        <xs:documentation>
        Display color of the plane stored as 3 RGB values in the range of 0..255.
      </xs:documentation>
                                </xs:annotation>
                        </xs:element>
                        <xs:element name="PatchBeam" minOccurs="2" maxOccurs="unbounded">
                                <xs:annotation>
                                        <xs:documentation>
        Defines the list of beams linked to this patch plane.
        The list must contain at least 2 entries.
      </xs:documentation>
                                </xs:annotation>
                                <xs:complexType>
                                        <xs:sequence>
                                                <xs:element name="Orientation"
type="syngoRT:OrientationType">
                                                        <xs:annotation>
                                                                <xs:documentation>
            Defines to which side of the patch plane the beam is linked.
            Obverse or reverse are defined with respect to the norm vector of the plane.
            Enumerated Values:
            OBVERSE: beam is associated to the obverse side of the plane
            REVERSE: beam is associated with the reverse side of the plane
          </xs:documentation>
                                                        </xs:annotation>
                                                </xs:element>
                                                <xs:element name="ReferencedBeamNumber"
type="xs:integer">
                                                        <xs:annotation>
                                                                <xs:documentation>
            References a beam in the beam sequence belonging to the patch plane.
            The beam is identified by the attribute "RT Ion Beams::Beam Number" (300A,00C0).
          </xs:documentation>
                                                        </xs:annotation>
                                                </xs:element>
                                        </xs:sequence>
                                </xs:complexType>
                        </xs:element>
                </xs:sequence>
        </xs:complexType>
        <xs:complexType name="RTBeamCommonSchema">
                <xs:annotation>
                        <xs:documentation>
      This declaration contains the parts which are common to the RT Beam and RT Ion Beam.
    </xs:documentation>
                </xs:annotation>
                <xs:all>
                </xs:all>
        </xs:complexType>
        <xs:complexType name="RTBeamSchema">
                <xs:annotation>
                        <xs:documentation>
      This declaration contains the parts which are specific for the RT Beam.
    </xs:documentation>
                </xs:annotation>
                <xs:complexContent>
                        <xs:extension base="RTBeamCommonSchema">
                                <xs:all>
                                        <xs:element name="RT_Beam_Creation_Date_Time" type="xs:string"
minOccurs="0" maxOccurs="1" />
                                        <xs:element name="Bolus_Description" type="xs:string" minOccurs="0"
/>
                                        <xs:element name="Gated_Delivery" type="xs:boolean" minOccurs="0"
/>
                                        <xs:element name="Treatment_Pause" type="xs:long" minOccurs="0" />
                                        <xs:element name="Treatment_Pause_Comment" type="xs:string"
minOccurs="0" />
                                        <xs:element name="Gantry_Table_Movement_Order" type="xs:long"
minOccurs="0" />
                                        <xs:element name="Beam_Delta" type="xs:long" minOccurs="0" />
```

```
                                        <xs:element name="Gantry_Direction_To_Next_Beam" type="xs:long"
minOccurs="0" />
                                        <xs:element name="Port_Only_Set" type="xs:boolean" minOccurs="0" />
                                        <xs:element name="KV_Beam_Energy" type="xs:double" minOccurs="0"
/>
                                        <xs:element name="KV_Beam_Exposure" type="xs:double"
minOccurs="0" />
                                        <xs:element name="Beam_Setup_Instructions" type="xs:string"
minOccurs="0" />
                                </xs:all>
                        </xs:extension>
                </xs:complexContent>
        </xs:complexType>
        <xs:complexType name="RTIonBeamSchema">
                <xs:annotation>
                        <xs:documentation>
      This declaration contains the parts which are specific for the RT Ion Beam.
    </xs:documentation>
                </xs:annotation>
                <xs:complexContent>
                        <xs:extension base="RTBeamCommonSchema">
                        </xs:extension>
                </xs:complexContent>
        </xs:complexType>
        <xs:complexType name="RTBeamsCommonSchema">
                <xs:annotation>
                        <xs:documentation>
      This declaration contains the parts which are common to the RT Beam and RT Ion Beam Sequence.
      It would be nice to already introduce an RTBeamCommonSchema element here, which would be
      refined to RTBeamSchema and RTIonBeamSchema in the derived types RTBeamsSchema and
RTIonBeamsSchema.
      Unfortunately, XML Schema does not allow for such covariance.
    </xs:documentation>
                </xs:annotation>
                <xs:sequence>
                        <xs:element name="PatchPlaneSequence" minOccurs="0">
                                <xs:annotation>
                                        <xs:documentation>
        Introduces an optional list of patch planes.
        Note that patch planes are not part of a single beam, they group beams from the bema sequence.
      </xs:documentation>
                                        <xs:appinfo uinf:app="VSim" uinf:usage="WRITTEN" />
                                </xs:annotation>
                                <xs:complexType>
                                        <xs:sequence>
                                                <xs:element name="PatchPlane" type="PatchPlaneType"
minOccurs="1" maxOccurs="unbounded" />
                                        </xs:sequence>
                                </xs:complexType>
                        </xs:element>
                </xs:sequence>
        </xs:complexType>
        <xs:complexType name="RTBeamsSchema">
                <xs:annotation>
                        <xs:documentation>
      This declaration contains the parts which are specific for the RT Beam Sequence.
    </xs:documentation>
                </xs:annotation>
                <xs:complexContent>
                        <xs:extension base="RTBeamsCommonSchema">
                                <xs:sequence>
                                        <xs:element name="RT_Beam" type="RTBeamSchema"
maxOccurs="unbounded" />
                                </xs:sequence>
                                <xs:attribute name="Beam_Name" type="xs:string" use="required" />
                        </xs:extension>
                </xs:complexContent>
        </xs:complexType>
        <xs:complexType name="RTIonBeamsSchema">
                <xs:annotation>
                        <xs:documentation>
      This declaration contains the parts which are specific for the RT Ion Beam Sequence.
```

```
    </xs:documentation>
                </xs:annotation>
                <xs:complexContent>
                        <xs:extension base="RTBeamsCommonSchema">
                                <xs:sequence>
                                        <xs:element name="RTIonBeam" type="RTIonBeamSchema"
minOccurs="0" maxOccurs="unbounded" />
                                </xs:sequence>
                        </xs:extension>
                </xs:complexContent>
        </xs:complexType>
        <xs:complexType name="RT_Approval_Shadow_Attribute_Schema">
                <xs:all>
                        <xs:element name="APPROVAL_STATUS" type="xs:string" minOccurs="0" />
                        <xs:element name="APPROVAL_REVIEWER_NAME" type="xs:string" minOccurs="0" />
                        <xs:element name="APPROVAL_REVIEW_DATE" type="xs:string" minOccurs="0" />
                        <xs:element name="APPROVAL_REVIEW_TIME" type="xs:string" minOccurs="0" />
                </xs:all>
        </xs:complexType>
        <xs:complexType name="RT_Plan_Type">
                <xs:sequence>
                        <xs:element name="RT_Tolerance_Table_Sequence"
type="RT_Tolerance_Table_Shadow_Attribute_Schema" minOccurs="0">
                                <xs:key name="Tolerance_Table_ID">
                                        <xs:selector xpath=".//NS:Tolerance_Table" />
                                        <xs:field xpath="@Tolerance_Table_Number" />
                                </xs:key>
                        </xs:element>
                        <xs:element name="RT_Prescription_Sequence"
type="RT_Prescription_Shadow_Attribute_Schema" minOccurs="0">
                                <xs:key name="Dose_Reference_ID">
                                        <xs:selector xpath=".//NS:Dose_Reference" />
                                        <xs:field xpath="@Dose_Reference_Number" />
                                </xs:key>
                        </xs:element>
                        <xs:element name="RT_Patient_Setup_Sequence"
type="RT_Patient_Setup_Shadow_Attribute_Schema" minOccurs="0">
                                <xs:key name="Patient_Setup_ID">
                                        <xs:selector xpath=".//NS:Patient_Setup" />
                                        <xs:field xpath="@Patient_Setup_Number" />
                                </xs:key>
                        </xs:element>
                        <xs:element name="RT_Fraction_Group_Sequence"
type="RT_Fraction_Group_Shadow_Attribute_Schema" minOccurs="0">
                                <xs:key name="Fraction_Group_ID">
                                        <xs:selector xpath=".//NS:Fraction_Group" />
                                        <xs:field xpath="@Fraction_Group_Number" />
                                </xs:key>
                        </xs:element>
                        <xs:element name="RT_Beam_Sequence" type="RTBeamsSchema" minOccurs="0">
                                <xs:annotation>
                                        <xs:documentation>
        If RT_Beam_Sequence occurs, then RTIonBeamSequence must not occur.
       </xs:documentation>
                                </xs:annotation>
                                <xs:key name="Beam_ID">
                                        <xs:selector xpath=".//NS:RT_Beam" />
                                        <xs:field xpath="@Beam_Name" />
                                </xs:key>
                        </xs:element>
                        <xs:element name="RTIonBeamSequence" type="RTIonBeamsSchema" minOccurs="0">
                                <xs:annotation>
                                        <xs:documentation>
        If RTIonBeamSequence occurs, then RT_Beam_Sequence must not occur.
       </xs:documentation>
                                </xs:annotation>
                        </xs:element>
                        <xs:element name="RT_BEAMS_APPROVAL"
type="RT_Approval_Shadow_Attribute_Schema" minOccurs="0" />
                        <xs:element name="RT_SITE_APPROVAL" type="RT_Approval_Shadow_Attribute_Schema"
minOccurs="0" />
```

```
                        <xs:element name="RT_QA_APPROVAL" type="RT_Approval_Shadow_Attribute_Schema"
minOccurs="0" />
                        <xs:element name="RT_Plan_Checksum" type="xs:string" minOccurs="0" />
                        <xs:element name="Completed_Plan" type="xs:boolean" minOccurs="0" />
                        <xs:element name="OIS_Plan" type="xs:boolean" minOccurs="0" />
                        <xs:element name="OIS_Transferred" type="xs:boolean" minOccurs="0" />
                        <xs:element name="RT_Plan_Late_Resumption_Notification" type="xs:string"
default="LR_NOTIFY_USER" minOccurs="0" />
                        <xs:element name="RT_Plan_Rx_Description" type="xs:string" minOccurs="0" />
                    </xs:sequence>
                    <xs:attribute name="Plan_UID" type="xs:string" use="required" />
                </xs:complexType>
                <xs:element name="RT_Plan" type="RT_Plan_Type" />
</xs:schema>
```

8.12.4 SpatialRegistrationExtensions.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  targetNamespace="http://www.siemens.com/med/ocs/syngoRT/SpatialRegistrationExtensions"
  xmlns="http://www.siemens.com/med/ocs/syngoRT/SpatialRegistrationExtensions"
  xmlns:uinf="http://www.siemens.com/med/ocs/usageInformation"
  xmlns:syngoRT="http://www.siemens.com/med/ocs/syngoRT/Common">
  <xs:import
    namespace="http://www.siemens.com/med/ocs/syngoRT/Common"
    schemaLocation="Common.xsd" />
  <xs:import
    namespace="http://www.siemens.com/med/ocs/usageInformation"
    schemaLocation="usageInformation.xsd" />
  <xs:element name="SpatialRegistration">
    <xs:annotation>
      <xs:documentation>
        Extensions for the Spatial Registration IOD
      </xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>
        <xs:element name="SpatialRegistration" type="SpatialRegistrationExtensionType" minOccurs="0"
maxOccurs="1"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:complexType name="SpatialRegistrationExtensionType">
    <xs:annotation>
      <xs:documentation>
        Extensions for the Spatial Registration Module to store result from STX localization
      </xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="Registration" type="RegistrationExtensionType" minOccurs="0" maxOccurs="1"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="RegistrationExtensionType">
    <xs:annotation>
      <xs:documentation>
        Extensions for the Registration Sequence within the Spatial Registration Module
      </xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="MatrixRegistration" type="MatrixRegistrationExtensionType" minOccurs="0"
maxOccurs="unbounded"/>
      <xs:element name="Settings" type="SettingsType" minOccurs="1" maxOccurs="1" />
      <xs:element name="Frame" type="FrameType" minOccurs="1" maxOccurs="1" />
      <xs:element name="SliceInfo" type="SliceInfoType" minOccurs="1" maxOccurs="1" />
      <xs:element name="SliceDistance" type="SliceDistanceType" minOccurs="1" maxOccurs="unbounded" />
      <xs:element name="Angles" type="AngleType" minOccurs="1" maxOccurs="1" />
      <xs:element name="RegressionCoefficients" type="RegressionCoefficientsType" minOccurs="3" maxOccurs="3"
/>
      <xs:element name="ResultsTable" type="ResultsTableType" minOccurs="1" maxOccurs="unbounded" />
    </xs:sequence>
```

```
</xs:complexType>
<xs:complexType name="MatrixRegistrationExtensionType">
  <xs:annotation>
    <xs:documentation>
      Extensions for Matrix Registration sequence
    </xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="QI" type="ResultType" minOccurs="1" maxOccurs="1" />
    <xs:element name="Matrix" type="MatrixType" />
    <xs:element name="ImageUIDRef" type="xs:string" />
  </xs:sequence>
</xs:complexType>
<xs:complexType name="ResultType">
  <xs:annotation>
    <xs:documentation>
      Defines the min and max quality index (QI) for the given matrix
    </xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="QImean" type="xs:float" />
    <xs:element name="QImax" type="xs:float" />
  </xs:sequence>
</xs:complexType>
<xs:complexType name="FrameType">
  <xs:annotation>
    <xs:documentation>
      Defines the name and ID of the frame used for localization
    </xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="Name" type="xs:string" />
    <xs:element name="ID" type="xs:string" />
  </xs:sequence>
</xs:complexType>
<xs:complexType name="SliceInfoType">
  <xs:annotation>
    <xs:documentation>
      Defines the information about slices used for localization
    </xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="NumberOfLocalizedSlices" type="xs:integer" />
    <xs:element name="NumberOfExcludedSlices" type="xs:integer" />
    <xs:element name="NumberOfNonLocalizedSlices" type="xs:integer" />
    <xs:element name="NumberOfBadLocalizedSlices" type="xs:integer" />
  </xs:sequence>
</xs:complexType>
<xs:complexType name="AngleType">
  <xs:annotation>
    <xs:documentation>
      Angles (between DICOM FOR and STX FOR) resulting from STX localization
    </xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="Alpha" type="xs:double" />
    <xs:element name="Beta" type="xs:double" />
    <xs:element name="Gamma" type="xs:double" />
  </xs:sequence>
</xs:complexType>
<xs:complexType name="SettingsType">
  <xs:annotation>
    <xs:documentation>
      Settings used for STX localization
    </xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="Threshold" type="xs:integer" />
    <xs:element name="SearchRadius" type="xs:double" />
    <xs:element name="QILimit" type="xs:double" />
  </xs:sequence>
</xs:complexType>
```

```
  <xs:complexType name="SliceDistanceType">
    <xs:annotation>
      <xs:documentation>
        Slice distances calculated from STX matrix
      </xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="NumberOfSlices" type="xs:integer" />
      <xs:element name="ReferenceDistance" type="xs:double" />
      <xs:element name="MeanDistance" type="xs:double" />
      <xs:element name="MaxDistance" type="xs:double" />
      <xs:element name="StandardDeviation" type="xs:double" />
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="RegressionCoefficientsType">
    <xs:annotation>
      <xs:documentation>
        Regression coefficients for LRMs
      </xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="a" type="xs:double" />
      <xs:element name="b" type="xs:double" />
      <xs:element name="r" type="xs:double" />
      <xs:element name="d" type="xs:double" />
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="ResultsTableType">
    <xs:annotation>
      <xs:documentation>
        Complete Result table (image center of each slice  is transformed to STX coordinates)
        Regression coefficients are calculated based on this table
      </xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="z_pcs" type="xs:double" />
      <xs:element name="x_stx" type="xs:double" />
      <xs:element name="y_stx" type="xs:double" />
      <xs:element name="z_stx" type="xs:double" />
      <xs:element name="x_res" type="xs:double" />
      <xs:element name="y_res" type="xs:double" />
      <xs:element name="z_res" type="xs:double" />
      <xs:element name="ImageUIDRef" type="xs:string" />
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="MatrixType">
    <xs:annotation>
      <xs:documentation>
        Defines the matrix type (GRM: global registration matrix, LRM: local registration matrix)
      </xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:string">
      <xs:enumeration value="GRM" />
      <xs:enumeration value="LRM" />
    </xs:restriction>
  </xs:simpleType>
</xs:schema>
```

8.12.5 RTTSyngoRTPlanExtensions.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema id="RT_General_Plan_private_attributes"
  targetNamespace="http://www.siemens.com/med/ocs/DICOM/2007/10/18/RTTSyngoRTPlanExtensions.xsd"
  xmlns="http://www.siemens.com/med/ocs/DICOM/2007/10/18/RTTSyngoRTPlanExtensions.xsd"
  xmlns:mstns="http://www.siemens.com/med/ocs/DICOM/2007/10/18/RTTSyngoRTPlanExtensions.xsd"
  xmlns:xs="http://www.w3.org/2001/XMLSchema">
    <xs:simpleType name="Lead_Dose_Type">
        <xs:restriction base="xs:double">
            <xs:minInclusive value="0"/>
        </xs:restriction>
    </xs:simpleType>
```

```
  <xs:simpleType name="Fraction_Time_Interval_Type">
    <xs:restriction base="xs:double">
      <xs:minInclusive value="0"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="Beam_Name_Type">
    <xs:restriction base="xs:string">
      <xs:length value="1"/>
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="RT_Tolerance_Table_Shadow_Attribute_Schema">
    <xs:sequence>
      <xs:element name="RT_Tolerance_Table" maxOccurs="unbounded">
        <xs:complexType>
          <xs:all>
            <xs:element name="RT_Tolerance_Table_Creation_Date_Time" type="xs:string" minOccurs="0"
maxOccurs="1"/>
            <xs:element name="SID_Tolerance"                    type="xs:long" minOccurs="0"
maxOccurs="1"/>
            <xs:element name="FlatPanel_LateralPos_Tolerance"     type="xs:long" minOccurs="0"
maxOccurs="1"/>
            <xs:element name="FlatPanel_LongitudinalPos_Tolerance" type="xs:long" minOccurs="0"
maxOccurs="1"/>
            <xs:element name="KV_SID_Tolerance"                 type="xs:long" minOccurs="0"
maxOccurs="1"/>
            <xs:element name="KV_FlatPanel_LateralPos_Tolerance"  type="xs:long" minOccurs="0"
maxOccurs="1"/>
          </xs:all>
          <xs:attribute name="Tolerance_Table_Number" type="xs:long"  use="required"/>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="RT_Prescription_Shadow_Attribute_Schema">
    <xs:sequence>
      <xs:element name="RT_Prescription" maxOccurs="unbounded">
        <xs:complexType>
          <xs:all>
            <xs:element name="RT_Prescription_Creation_Date_Time" type="xs:string" minOccurs="0"
maxOccurs="1"/>
            <xs:element name="Lead_Dose"                    type="Lead_Dose_Type" minOccurs="0"/>
            <xs:element name="Delivery_Warning_Dose_Description" type="xs:string"     minOccurs="0"/>
          </xs:all>
          <xs:attribute name="Dose_Reference_Number" type="xs:long" use="required"/>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="RT_Patient_Setup_Shadow_Attribute_Schema">
    <xs:sequence>
      <xs:element name="RT_Patient_Setup" maxOccurs="unbounded">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="RT_Patient_Setup_Creation_Date_Time" type="xs:string" minOccurs="0"
maxOccurs="1"/>
            <xs:element name="Patient_Setup_Name" type="xs:string"/>
            <xs:element name="Additional_Setup_Instructions" type="xs:string"/>
            <xs:element name="Referenced_Setup_Image_Sequence" minOccurs="0">
              <xs:complexType>
                <xs:sequence>
                  <xs:element name="Setup_Image" minOccurs="1">
                    <xs:complexType>
                      <xs:sequence>
                        <xs:element name="Setup_Image_Description"    type="xs:string"/>
                        <xs:element name="Referenced_SOP_Class_UID"   type="xs:string"/>
                        <xs:element name="Referenced_SOP_Instance_UID" type="xs:string"/>
                      </xs:sequence>
                    </xs:complexType>
                  </xs:element>
                </xs:sequence>
              </xs:complexType>
            </xs:element>
```

```
            </xs:sequence>
            <xs:attribute name="Patient_Setup_Number" type="xs:long" use="required"/>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="RT_Fraction_Group_Shadow_Attribute_Schema">
      <xs:sequence>
        <xs:element name="RT_Fraction_Group" maxOccurs="unbounded">
          <xs:complexType>
            <xs:all>
              <xs:element name="RT_Fraction_Group_Creation_Date_Time" type="xs:string" minOccurs="0"
maxOccurs="1"/>
              <xs:element name="Fraction_Group_Name"    type="xs:string"/>
              <xs:element name="Fraction_Time_Interval" type="Fraction_Time_Interval_Type" minOccurs="0"/>
              <xs:element name="Fractions_Per_Week"     type="xs:long"/>
            </xs:all>
            <xs:attribute name="Fraction_Group_Number" type="xs:long" use="required"/>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="RT_Beam_Shadow_Attribute_Schema">
      <xs:sequence>
        <xs:element name="RT_Beam" maxOccurs="unbounded">
          <xs:complexType>
            <xs:all>
              <xs:element name="RT_Beam_Creation_Date_Time" type="xs:string" minOccurs="0"
maxOccurs="1"/>
              <xs:element name="Bolus_Description" type="xs:string"  minOccurs="0"/>
              <xs:element name="Gated_Delivery" type="xs:boolean" minOccurs="0"/>
              <xs:element name="Treatment_Pause" type="xs:long" minOccurs="0"/>
              <xs:element name="Treatment_Pause_Comment" type="xs:string" minOccurs="0"/>
              <xs:element name="Gantry_Table_Movement_Order" type="xs:long" minOccurs="0"/>
              <xs:element name="Beam_Delta" type ="xs:long" minOccurs="0"/>
              <xs:element name="Gantry_Direction_To_Next_Beam" type="xs:long" minOccurs="0"/>
              <xs:element name="Port_Only_Set" type="xs:boolean" minOccurs="0"/>
              <xs:element name="KV_Beam_Energy" type="xs:double" minOccurs="0"/>
              <xs:element name="KV_Beam_Exposure" type="xs:double" minOccurs="0"/>
              <xs:element name="Beam_Setup_Instructions" type="xs:string"  minOccurs="0"/>
            </xs:all>
            <xs:attribute name="Beam_Name" type="Beam_Name_Type"  use="required"/>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <xs:complexType name="RT_Approval_Shadow_Attribute_Schema">
      <xs:all>
        <xs:element name="APPROVAL_STATUS"       type="xs:string" minOccurs="0"/>
        <xs:element name="APPROVAL_REVIEWER_NAME" type="xs:string" minOccurs="0"/>
        <xs:element name="APPROVAL_REVIEW_DATE"   type="xs:string" minOccurs="0"/>
        <xs:element name="APPROVAL_REVIEW_TIME"   type="xs:string" minOccurs="0"/>
      </xs:all>
    </xs:complexType>
    <xs:complexType name = "RT_Plan_Type">
      <xs:sequence>
        <xs:element name="RT_Tolerance_Table_Sequence"
                type="RT_Tolerance_Table_Shadow_Attribute_Schema"
                minOccurs="0">
          <xs:key name="Tolerance_Table_ID">
            <xs:selector xpath=".//Tolerance_Table"/>
            <xs:field xpath="@Tolerance_Table_Number"/>
          </xs:key>
        </xs:element>
        <xs:element name="RT_Prescription_Sequence"
                type="RT_Prescription_Shadow_Attribute_Schema"
                minOccurs="0">
          <xs:key name="Dose_Reference_ID">
            <xs:selector xpath=".//Dose_Reference"/>
            <xs:field xpath="@Dose_Reference_Number"/>
          </xs:key>
        </xs:element>
```

```
        <xs:element name="RT_Patient_Setup_Sequence"
                type="RT_Patient_Setup_Shadow_Attribute_Schema"
                minOccurs="0">
          <xs:key name="Patient_Setup_ID">
            <xs:selector xpath=".//Patient_Setup"/>
            <xs:field xpath="@Patient_Setup_Number"/>
          </xs:key>
        </xs:element>
        <xs:element name="RT_Fraction_Group_Sequence"
                type="RT_Fraction_Group_Shadow_Attribute_Schema"
                minOccurs="0">
          <xs:key name="Fraction_Group_ID">
            <xs:selector xpath=".//Fraction_Group"/>
            <xs:field xpath="@Fraction_Group_Number"/>
          </xs:key>
        </xs:element>
        <xs:element name="RT_Beam_Sequence"
                type="RT_Beam_Shadow_Attribute_Schema"
                minOccurs="0">
          <xs:key name="Beam_ID">
            <xs:selector xpath=".//RT_Beam"/>
            <xs:field xpath="@Beam_Name"/>
          </xs:key>
        </xs:element>
        <xs:element name="RT_BEAMS_APPROVAL" type="RT_Approval_Shadow_Attribute_Schema"
minOccurs="0"/>
        <xs:element name="RT_SITE_APPROVAL"  type="RT_Approval_Shadow_Attribute_Schema"
minOccurs="0"/>
        <xs:element name="RT_QA_APPROVAL"    type="RT_Approval_Shadow_Attribute_Schema" minOccurs="0"/>
        <xs:element name="RT_Plan_Checksum" type="xs:string"  minOccurs="0"/>
        <xs:element name="Completed_Plan"   type="xs:boolean" minOccurs="0"/>
        <xs:element name="OIS_Plan"         type="xs:boolean" minOccurs="0"/>
        <xs:element name="OIS_Transferred"  type="xs:boolean" minOccurs="0"/>
        <xs:element name="RT_Plan_Late_Resumption_Notification" type="xs:string" default="LR_NOTIFY_USER"
minOccurs="0"/>
        <xs:element name="RT_Plan_Rx_Description" type="xs:string" minOccurs="0"/>
      </xs:sequence>
      <xs:attribute name="Plan_UID" type="xs:string" use="required"/>
    </xs:complexType>
    <xs:element name="RT_Plan" type = "RT_Plan_Type"/>
</xs:schema>
```

8.12.6 RTTSyngoRTBeamsTxRecordExtensions.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema id="RTTxBeamSessionReport"
targetNamespace="http://www.siemens.com/med/ocs/DICOM/2007/10/18/RTTSyngoRTBeamsTxRecordExtensions.xs
d" xmlns="http://www.siemens.com/med/ocs/DICOM/2007/10/18/ RTTSyngoRTBeamsTxRecordExtensions.xsd"
xmlns:mstns="http://www.siemens.com/med/ocs/DICOM/2007/10/18/ RTTSyngoRTBeamsTxRecordExtensions.xsd"
xmlns:xs="http://www.w3.org/2001/XMLSchema">

  <xs:complexType name="RT_Summary_FractionGroup_Data">
    <xs:sequence>
      <xs:element name="Fraction_Group_Summary_Sequence_3008_0220" minOccurs="1">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="Fraction_Status_Summary_Sequence_3008_0240" maxOccurs="unbounded">
              <xs:complexType>
                <xs:all>
                  <xs:element name="Fraction_Termination_Status_3008_002A" type="xs:string" minOccurs="1"
maxOccurs="1"/>
                </xs:all>
                <xs:attribute name="Referenced_Fraction_Number_3008_0223" type="xs:positiveInteger"
use="required"/>
              </xs:complexType>
              <xs:key name="Referenced_Fraction_Number_3008_0223">
                <xs:selector xpath=".//Referenced_Fraction_Number_3008_0223"/>
                <xs:field xpath="@Referenced_Fraction_Number_3008_0223"/>
              </xs:key>
            </xs:element>
          </xs:sequence>
```

```
        <xs:attribute name="Referenced_Fraction_Group_Number_300C_0022" type="xs:positiveInteger"
use="required"/>
       </xs:complexType>
       <xs:key name="Referenced_Fraction_Group_Number_300C_0022">
        <xs:selector xpath=".//Referenced_Fraction_Group_Number_300C_0022"/>
        <xs:field xpath="@Referenced_Fraction_Group_Number_300C_0022"/>
       </xs:key>
     </xs:element>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name = "RT_Beam_Session_Record_Type">
    <xs:sequence>
     <xs:element name="RT_Summary_Record_Attributes" type="RT_Summary_FractionGroup_Data"
minOccurs="0"/>
     <xs:element name="QA_Record" type="xs:boolean" minOccurs="0"/>
     <xs:element name="MANUAL_RECORD_OIS" type="xs:boolean" minOccurs="0"/>
     <xs:element name="Treatment_Notes" minOccurs="0">
      <xs:complexType>
       <xs:simpleContent>
        <xs:extension base="xs:string">
        <xs:attribute name="Referenced_Fraction_Number_3008_0223" type="xs:positiveInteger" use="required"/>
        <xs:attribute name="Setup_Index_Number" type="xs:positiveInteger" use="required"/>
        </xs:extension>
       </xs:simpleContent>
      </xs:complexType>
     </xs:element>
    </xs:sequence>
  </xs:complexType>

  <xs:element name="RT_Beam_Session_Record" type = "RT_Beam_Session_Record_Type"/>

</xs:schema>
```

8.12.7 RTPlanActionStatus.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  targetNamespace="http://www.siemens.com/med/ocs/syngoRT/RTPlanActionStatus"
  xmlns="http://www.siemens.com/med/ocs/syngoRT/RTPlanActionStatus"
  xmlns:uinf="http://www.siemens.com/med/ocs/usageInformation"
  xmlns:syngoRT="http://www.siemens.com/med/ocs/syngoRT/Common">
  <xs:import
    namespace="http://www.siemens.com/med/ocs/syngoRT/Common"
    schemaLocation="Common.xsd" />
  <xs:import
    namespace="http://www.siemens.com/med/ocs/usageInformation"
    schemaLocation="usageInformation.xsd" />
  <xs:element name="RT_Plan_Action_Status_SR_Document">
    <xs:annotation>
      <xs:documentation>
        The information described in this schema is stored in the private DICOM attribute
        "Structured Report::SR Document Content::syngo Report Data" (0029,1010).
      </xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>
        <xs:element name="Referenced_Plan" minOccurs="1" maxOccurs="1">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="Plan_Label" type="xs:string" minOccurs="1" maxOccurs="1"/>
              <xs:element name="Referenced_Plan_Version_UID" type="xs:string" minOccurs="1" maxOccurs="1"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
        <xs:element name="Dose_Alert_Acknowledgements" minOccurs="0" maxOccurs="1">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="Dose_Reference" minOccurs="1" maxOccurs="1">
                <xs:complexType>
```

```
            <xs:sequence>
              <xs:element name="Lead_Dose_Alert_Acknowledgements" minOccurs="0" maxOccurs="unbounded">
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="Dose_Alert_Acknowledgment_Container"
type="Dose_Acknowledgement_Container_Type" minOccurs="1" maxOccurs="unbounded"/>
                  </xs:sequence>
                </xs:complexType>
              </xs:element>
              <xs:element name="Warning_Dose_Alert_Acknowledgements" minOccurs="0"
maxOccurs="unbounded">
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="Dose_Alert_Acknowledgment_Container"
type="Dose_Acknowledgement_Container_Type" minOccurs="1" maxOccurs="unbounded"/>
                  </xs:sequence>
                </xs:complexType>
              </xs:element>
              <xs:element name="Dose_Reference_Number" type="xs:string" minOccurs="1" maxOccurs="1"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="Patient_Treatment_Chart_Status" minOccurs="0" maxOccurs="1">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="Last_Printer_Configuration_Change" type="syngoRT:DICOMDateTime" minOccurs="1"
maxOccurs="1"/>
        <xs:element name="Start_Row_Number" type="xs:unsignedByte" minOccurs="1" maxOccurs="1"/>
        <xs:element name="Start_Page_Number" type="xs:unsignedByte" minOccurs="1" maxOccurs="1"/>
        <xs:element name="Report_Template_Last_Modification_Date_Time" type="syngoRT:DICOMDateTime"
minOccurs="1" maxOccurs="1"/>
        <xs:element name="Tx_Chart_First_Print_Date_Time" type="syngoRT:DICOMDateTime" minOccurs="1"
maxOccurs="1"/>
        <xs:element name="Tx_Chart_Last_Print_Date_Time" type="syngoRT:DICOMDateTime" minOccurs="1"
maxOccurs="1"/>
        <xs:element name="Tx_Chart_Start_Date_Time" type="syngoRT:DICOMDateTime" minOccurs="1"
maxOccurs="1"/>
        <xs:element name="Report_Template_Name" type="xs:string" minOccurs="1" maxOccurs="1"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
 </xs:sequence>
</xs:complexType>
</xs:element>
<xs:complexType name="Dose_Acknowledgement_Container_Type">
 <xs:sequence>
  <xs:element name="Dose_Level" type="xs:string" minOccurs="1" maxOccurs="1"/>
  <xs:element name="Acknowledgement_Date_Time" type="syngoRT:DICOMDateTime" minOccurs="1"
maxOccurs="1"/>
  <xs:element name="Acknowledging_User" type="xs:string" minOccurs="1" maxOccurs="1"/>
 </xs:sequence>
</xs:complexType>
</xs:schema>
```

8.12.8 RTTSyngoPlanActionStatusSR.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema id="PlanActionStatusStructuredReport"
 targetNamespace="http://www.siemens.com/med/ocs/DICOM/2007/10/18/RTTSyngoPlanActionStatusSR.xsd"
 xmlns="http://www.siemens.com/med/ocs/DICOM/2007/10/18/RTTSyngoPlanActionStatusSR.xsd"
 xmlns:mstns="http://www.siemens.com/med/ocs/DICOM/2007/10/18/RTTSyngoPlanActionStatusSR.xsd"
 xmlns:xs="http://www.w3.org/2001/XMLSchema">
 <xs:element name="RT_Plan_Action_Status_SR_Document">
  <xs:complexType>
   <xs:sequence>
    <xs:element name="Referenced_Plan" minOccurs="1" maxOccurs="1">
     <xs:complexType>
      <xs:sequence>
```

```
          <xs:element name="Plan_Label" type="xs:string" minOccurs="1" maxOccurs="1" />
          <xs:element name="Referenced_Plan_Version_UID" type="xs:string" minOccurs="1" maxOccurs="1" />
        </xs:sequence>
       </xs:complexType>
      </xs:element>
      <xs:element name="Dose_Alert_Acknowledgements" minOccurs="0" maxOccurs="1">
       <xs:complexType>
        <xs:sequence>
         <xs:element name="Dose_Reference" minOccurs="1" maxOccurs="1">
          <xs:complexType>
           <xs:sequence>
            <xs:element name="Lead_Dose_Alert_Acknowledgements" minOccurs="0" maxOccurs="unbounded">
             <xs:complexType>
              <xs:sequence>
               <xs:element name="Dose_Alert_Acknowledgment_Container"
type="Dose_Acknowledgement_Container_Type" minOccurs="1" maxOccurs="unbounded" />
              </xs:sequence>
             </xs:complexType>
            </xs:element>
            <xs:element name="Warning_Dose_Alert_Acknowledgements" minOccurs="0"
maxOccurs="unbounded">
             <xs:complexType>
              <xs:sequence>
               <xs:element name="Dose_Alert_Acknowledgment_Container"
type="Dose_Acknowledgement_Container_Type" minOccurs="1" maxOccurs="unbounded" />
              </xs:sequence>
             </xs:complexType>
            </xs:element>
            <xs:element name="Dose_Reference_Number" type="xs:string" minOccurs="1" maxOccurs="1" />
           </xs:sequence>
          </xs:complexType>
         </xs:element>
        </xs:sequence>
       </xs:complexType>
      </xs:element>
      <xs:element name="Patient_Treatment_Chart_Status" minOccurs="0" maxOccurs="1">
       <xs:complexType>
        <xs:sequence>
         <xs:element name="Last_Printer_Configuration_Change" type="xs:string" minOccurs="1" maxOccurs="1"
/>
         <xs:element name="Start_Row_Number" type="xs:unsignedByte" minOccurs="1" maxOccurs="1" />
         <xs:element name="Start_Page_Number" type="xs:unsignedByte" minOccurs="1" maxOccurs="1" />
         <xs:element name="Report_Template_Last_Modification_Date_Time" type="xs:string" minOccurs="1"
maxOccurs="1" />
         <xs:element name="Tx_Chart_First_Print_Date_Time" type="xs:string" minOccurs="1" maxOccurs="1" />
         <xs:element name="Tx_Chart_Last_Print_Date_Time" type="xs:string" minOccurs="1" maxOccurs="1" />
         <xs:element name="Tx_Chart_Start_Date_Time" type="xs:string" minOccurs="1" maxOccurs="1" />
         <xs:element name="Report_Template_Name" type="xs:string" minOccurs="1" maxOccurs="1" />
        </xs:sequence>
       </xs:complexType>
      </xs:element>
     </xs:sequence>
    </xs:complexType>
   </xs:element>
   <xs:complexType name="Dose_Acknowledgement_Container_Type">
    <xs:sequence>
     <xs:element name="Dose_Level" type="xs:string" minOccurs="1" maxOccurs="1" />
     <xs:element name="Acknowledgement_Date_Time" type="xs:string" minOccurs="1" maxOccurs="1" />
     <xs:element name="Acknowledging_User" type="xs:string" minOccurs="1" maxOccurs="1" />
    </xs:sequence>
   </xs:complexType>
</xs:schema>
```

8.12.9 SrObject.xsd

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified"
attributeFormDefault="unqualified">
        <xs:element name="OCS_SR">
                <xs:complexType>
                        <xs:sequence>
```

```
                        <xs:element name="Header">
                                <xs:complexType>
                                        <xs:sequence>
                                                <xs:element name="Type" type="xs:string"/>
                                                <xs:element name="ApplicationName"
type="xs:string"/>
                                                <xs:element name="ApplicationVersion"
type="xs:string"/>
                                                <xs:element name="CreatorID" type="xs:string"/>
                                                <xs:element name="CreatedLocationName"
type="xs:string"/>
                                                <xs:element name="LastModificationDate"
type="xs:date"/>
                                                <xs:element name="LastModificationTime"
type="xs:time"/>
                                                <xs:element name="TaskId" type="xs:int"/>
                                        </xs:sequence>
                                </xs:complexType>
                        </xs:element>
                        <xs:element name="Data">
                                <xs:complexType>
                                        <xs:sequence>
                                                <xs:element name="Report" type="xs:string"/>
                                        </xs:sequence>
                                </xs:complexType>
                        </xs:element>
                </xs:sequence>
        </xs:complexType>
    </xs:element>
</xs:schema>
```

8.12.10 PCR_SRObject.xsd

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified"
attributeFormDefault="unqualified">
    <xs:element name="OCS_SR">
        <xs:complexType>
            <xs:sequence>
                <xs:element name="Header">
                    <xs:complexType>
                        <xs:sequence>
                            <xs:element name="SRObjectHeaderInformation"
type="xs:string" />
                        </xs:sequence>
                    </xs:complexType>
                </xs:element>
                <xs:element name="Data">
                    <xs:complexType>
                        <xs:sequence>
                            <xs:element name="XOffsetValue" type="xs:double" />
                            <xs:element name="YOffsetValue" type="xs:double" />
                            <xs:element name="ZOffsetValue" type="xs:double" />
                            <xs:element name="FractionNumber" type="xs:decimal"
/>
                            <xs:element name="FractionDate" type="xs:date" />
                            <xs:element name="FractionTime" type="xs:time" />
                            <xs:element name="AcceptedUser" type="xs:string" />
                            <xs:element name="CalculatedDate" type="xs:date" />
                            <xs:element name="CalculatedTime" type="xs:time" />
                            <xs:element name="PrimaryPorImgUID"
type="xs:string" />
                            <xs:element name="PrimaryPCRUID" type="xs:string"
/>
                            <xs:element name="PredecessorPCRUID"
type="xs:string" />
                            <xs:element name="PCRUID" type="xs:string" />
                            <xs:element name="SiteName" type="xs:string" />
                        </xs:sequence>
                    </xs:complexType>
                </xs:element>
```

```
                    </xs:sequence>
                </xs:complexType>
        </xs:element>
</xs:schema>
```

8.12.11 TRR_SRObject.xsd

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified"
attributeFormDefault="unqualified">
        <xs:element name="OCS_SR">
                <xs:annotation>
                        <xs:documentation>Root element</xs:documentation>
                </xs:annotation>
                <xs:complexType>
                        <xs:sequence>
                                <xs:element name="Header">
                                        <xs:complexType>
                                                <xs:sequence>
                                                        <xs:element name="SRObjectHeadeInformation"
type="xs:anySimpleType"/>
                                                </xs:sequence>
                                        </xs:complexType>
                                </xs:element>
                                <xs:element name="Data">
                                        <xs:complexType>
                                                <xs:sequence>
                                                        <xs:element name="Review">
                                                                <xs:complexType>
                                                                        <xs:sequence>
                                                                                <xs:element
name="ReviewDate" type="xs:date"/>
                                                                                <xs:element
name="ReviewTime" type="xs:time"/>
                                                                                <xs:element
name="ReviewBy" type="xs:string"/>
                                                                                <xs:element
name="ReviewResult" type="xs:string"/>
                                                                                <xs:element
name="Comment" type="xs:string"/>
                                                                        </xs:sequence>
                                                                </xs:complexType>
                                                        </xs:element>
                                                        <xs:element name="FractionNumber"
type="xs:integer"/>
                                                        <xs:element name="FractionDateTime"
type="xs:dateTime"/>
                                                        <xs:element name="ImageSeq">
                                                                <xs:complexType>
                                                                        <xs:sequence>
                                                                                <xs:element name="Image"
maxOccurs="unbounded">
                                                                                        <xs:complexType>

        <xs:sequence>

        <xs:element name="UID" type="xs:string"/>

        <xs:element name="Status" type="xs:string"/>

        </xs:sequence>
                                                                                        </xs:complexType>
                                                                                </xs:element>
                                                                        </xs:sequence>
                                                                </xs:complexType>
                                                        </xs:element>
                                                        <xs:element name="PCRSeq">
                                                                <xs:complexType>
                                                                        <xs:sequence>
                                                                                <xs:element name="PCR"
maxOccurs="unbounded">
```

```
                                                
```

```
      <xs:element name="NO_DATA_FLAG" type="xs:boolean" />
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="MATRIX" type="xs:string">
  <xs:annotation>
    <xs:documentation xml:lang="en">
      Actual matrix information, decimal strings, row by row, repeating values only once with their
      multiplicity. The direction of the transformation stored depends on CSA Data Type (0029,xx08):

      if CSA Data Type (0029,xx08) == "STX MATRIX" (OCS syngo RT private extension)
      then
        Model: image data (MR, CT)
        Reference: STX System
        Matrix is FROM model TO reference
      elseif CSA Data Type (0029,xx08) == "STX DSA Matrix" (OCS syngo RT private extension)
      then
        Model: STX system
        Reference: DSA image (2D)
        Matrix is FROM model TO reference
      elseif CSA Data Type (0029,xx08) == "3D 2D FUSION MATRIX" (OCS syngo RT private extension)
      then
        Model: image system (3D i.e. MR,CT):
        Reference: image system (2D, i.e. DSA)
        Matrix is FROM model TO reference
      else
        Matrix is FROM reference TO model
      endif

    </xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name="MATRIX_ID" type="xs:string">
  <xs:annotation>
    <xs:documentation xml:lang="en">
      Describes the matrix dataset pair :
      SIUIDreference":"FoRreference"_"SIUIDmodel":"FoRmodel
      where:
      SIUID - DICOM Series Instance UID
      FoR -   DICOM Frame of Reference
      (delimiters: ":" and "_").
    </xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name="MATRIX_TYPE" type="xs:unsignedByte">
  <xs:annotation>
    <xs:documentation xml:lang="en">
      Describes how matrix was generated:
      5 - using landmarks (fiducials)
      6 - manually (using visual alignment)
      7 - using surface matching algorithm
      8 - using mutual information
    </xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name="CENTER_DS1" type="xs:unsignedShort">
  <xs:annotation>
    <xs:documentation xml:lang="en">
      Windowing center of reference dataset.
    </xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name="WIDTH_DS1" type="xs:unsignedShort">
  <xs:annotation>
    <xs:documentation xml:lang="en">
      Windowing width of reference dataset.
    </xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name="CENTER_DS2" type="xs:unsignedShort">
  <xs:annotation>
    <xs:documentation xml:lang="en">
```

```
            Windowing center of model dataset.
          </xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="WIDTH_DS2" type="xs:unsignedShort">
        <xs:annotation>
          <xs:documentation xml:lang="en">
            Windowing width of model dataset.
          </xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="LUT_DS1" type="xs:string">
        <xs:annotation>
          <xs:documentation xml:lang="en">
            Color LUT applied to reference dataset.
          </xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="LUT_DS2" type="xs:string">
        <xs:annotation>
          <xs:documentation xml:lang="en">
            Color LUT applied to model dataset.
          </xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="MIX" type="xs:decimal">
        <xs:annotation>
          <xs:documentation xml:lang="en">
            Mixing ratio, value range [0.0,1.0].
          </xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="THRMIN_DS1" type="xs:unsignedShort">
        <xs:annotation>
          <xs:documentation xml:lang="en">
            Min. visibility threshold for reference dataset
          </xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="THRMAX_DS1" type="xs:unsignedShort">
        <xs:annotation>
          <xs:documentation xml:lang="en">
            Max. visibility threshold for reference dataset.
          </xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="THRMIN_DS2" type="xs:unsignedShort">
        <xs:annotation>
          <xs:documentation xml:lang="en">
            Min. visibility threshold for model dataset.
          </xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="THRMAX_DS2" type="xs:unsignedShort">
        <xs:annotation>
          <xs:documentation xml:lang="en">
            Max. visibility threshold for model dataset.
          </xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
 </xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:schema>
```

8.12.13 PhantomDetectorMeasurements.xsd

```
<?xml version="1.0" encoding="utf-8"?>
```

```
<xs:schema
  xmlns:i="http://www.w3.org/2001/XMLSchema-instance"

targetNamespace="http://schemas.datacontract.org/2004/07/syngo.RT.Services.TxSessionDataSC.ModelFactoryBO.C
ore"
  xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:annotation>
    <xs:documentation>
      Instances of this schema are written into a private DICOM tag
        "RT Ion Beam Session Record::Phantom Detector Measurements" (300B,xxB1).
    </xs:documentation>
  </xs:annotation>
  <xs:element name="PhantomDetectorMeasurements">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="DetectorArrayLateralPosition" type="xs:decimal" />
        <xs:element name="DetectorArrayLongitudinalPosition" type="xs:decimal" />
        <xs:element name="DetectorArrayVerticalPosition" type="xs:decimal" />
        <xs:element name="DetectorPointMeasuredDoses" maxOccurs="unbounded">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="DetectorPointMeasuredDose" type="xs:decimal" />
                    <xs:element name="AirDensityCorrectionFactor" type="xs:decimal" />
              <xs:element name="Dose2WaterRadiationCorrectionFactor" type="xs:decimal" />
              <xs:element name="ElectrometerCorrectionFactor" type="xs:decimal" />
              <xs:element name="HumidityCorrectionFactor" type="xs:decimal" />
              <xs:element name="IonRecombinationCorrectionFactor" type="xs:decimal" />
              <xs:element name="IonSpeciesCorrectionFactor" type="xs:decimal" />
              <xs:element name="PolarityCorrectionFactor" type="xs:decimal" />
              <xs:element name="UserCorrectionFactor" type="xs:decimal" />
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:schema>
```

8.12.14 TreatmentEvents.xsd

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified">
        <xs:element name="ToleranceViolations">
                <xs:complexType>
                        <xs:sequence>
                                <xs:element ref="Violation" maxOccurs="unbounded"/>
                        </xs:sequence>
                </xs:complexType>
        </xs:element>
        <xs:element name="TreatmentEvents">
                <xs:complexType>
                        <xs:sequence>
                                <xs:element ref="ToleranceViolations"/>
                        </xs:sequence>
                </xs:complexType>
        </xs:element>
        <xs:element name="Violation">
                <xs:complexType>
                        <xs:attribute name="IesNumber" type="xs:unsignedInt" use="required"/>
                        <xs:attribute name="VoxelIndex" type="xs:unsignedInt" use="required"/>
                        <xs:attribute name="Type" use="required">
                                <xs:simpleType>
                                        <xs:restriction base="xs:string">
                                                <xs:enumeration value="ERROR"/>
                                                <xs:enumeration value="INTENSITY"/>
                                                <xs:enumeration value="POSITION"/>
                                                <xs:enumeration value="POSITION_AND_INTENSITY"/>
                                                <xs:enumeration value="LOW_INTENSITY"/>
                                                <xs:enumeration value="POSITION_NOT_CONFIRMED"/>
                                        </xs:restriction>
                                </xs:simpleType>
```

```
                        </xs:attribute>
                    </xs:complexType>
                </xs:element>
</xs:schema>
```

8.12.15 usageInformation.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema
 xmlns:xs="http://www.w3.org/2001/XMLSchema"
 targetNamespace="http://www.siemens.com/med/ocs/usageInformation"
 xmlns="http://www.siemens.com/med/ocs/usageInformation">
 <xs:annotation>
  <xs:documentation>
   This namespace defines infrastructure to document application usage of individual elements.
  </xs:documentation>
 </xs:annotation>
 <xs:simpleType name="UsageType">
  <xs:annotation>
   <xs:documentation>
    This enumeration type is used in the appinfo-tag in order to specify
    the usage of some piece of information through some application.
   </xs:documentation>
  </xs:annotation>
  <xs:restriction base="xs:string">
   <xs:enumeration value="WRITTEN">
    <xs:annotation>
     <xs:documentation>
      Application does not expect any value for the attribute, either initially fills or overwrites the attribute.
     </xs:documentation>
    </xs:annotation>
   </xs:enumeration>
   <xs:enumeration value="READ">
    <xs:annotation>
     <xs:documentation>
      Application expects some value to be present which is not modified.
     </xs:documentation>
    </xs:annotation>
   </xs:enumeration>
   <xs:enumeration value="MODIFIED">
    <xs:annotation>
     <xs:documentation>
      Application expects some value to be present which is read, modified and written
     </xs:documentation>
    </xs:annotation>
   </xs:enumeration>
  </xs:restriction>
 </xs:simpleType>
 <xs:attribute name="app" type="xs:string">
  <xs:annotation>
   <xs:documentation>
    Attribute specifying the name of an application using some piece of information.
   </xs:documentation>
  </xs:annotation>
 </xs:attribute>
 <xs:attribute name="usage" type="UsageType">
  <xs:annotation>
   <xs:documentation>
    Attribute specifying the usage of some piece of information through some application.
   </xs:documentation>
  </xs:annotation>
 </xs:attribute>
 <xs:complexType name="usageInfo">
  <xs:sequence />
  <xs:attribute ref="usage" />
  <xs:attribute ref="app" />
 </xs:complexType>
</xs:schema>
```